ASBESTOS SURVEY INVENTORY
ANNETTE ISLAND STATION
ANNETTE ISLAND, ALASKA

PREPARED FOR:

FEDERAL AVIATION ADMINISTRATION
NATIONAL HEADQUARTERS
AIRWAY FACILITIES DIVISION ANS-510
800 INDEPENDENCE AVENUE, SW
WASHINGTON, DC 20591

DECEMBER 12, 1994

PREPARED BY:

RESEARCH MANAGEMENT CONSULTANTS INC.
ENVIRONMENTAL ENGINEERING DIVISION
3190 S. WADSWORTH BLVD., SUITE 100
LAKEWOOD, COLORADO 80227
(303) 969-8778

FAA CONTRACT NO. DTFA01-93-D-00035
SBA CONTRACT NO. SB9-93-1-1072

RMCI PROJECT NO. A160-2-057

SKOV/LEON

FEDERAL AVIATION ADMINISTRATION

US DEPARTMENT OF TRANSPORTATION

Prepared By:

Esther Skov
Industrial Hygiene Technician

Reviewed By:

Eric Havelick
Industrial Hygienist

Reviewed By:

Gina Festi-Gitano
Inspection Support Supervisor

TABLE OF CONTENTS

1.1 INTRODUCTION

This asbestos inspection report presents data which describe the condition and location of asbestos-containing material (ACM) identified at the Annette Island Station. This report is to be used as a program planning tool for all construction and maintenance activities scheduled at these facilities.

All ACM identified in this report should be handled in accordance with all applicable federal, state, and local regulatory requirements. To facilitate compliance with FAA management policy, and as an aid to minimize employee exposure, this inspection report should also be used in conjunction with the FAA Operations and Maintenance Policy Manual for Asbestos-Containing Materials. Appropriate personnel should be trained to use this inspection report in conjunction with planned Operations & Maintenance (O&M) activities or renovations so these activities are conducted properly. This will assist in preventing potential exposure to airborne asbestos fibers, or the creation of an emergency abatement or clean-up operation.

The combined goals of sampling and visual assessments are as follows:

1) identify ACM at a facility and document the condition, friability, location, and quantity of each identified material; and

2) consolidate sample data and observations obtained during site visits into report form, applicable parts of which will be incorporated into a facility O&M Manual (where relevant).

1.2 INSPECTION AND SAMPLING PROCEDURE

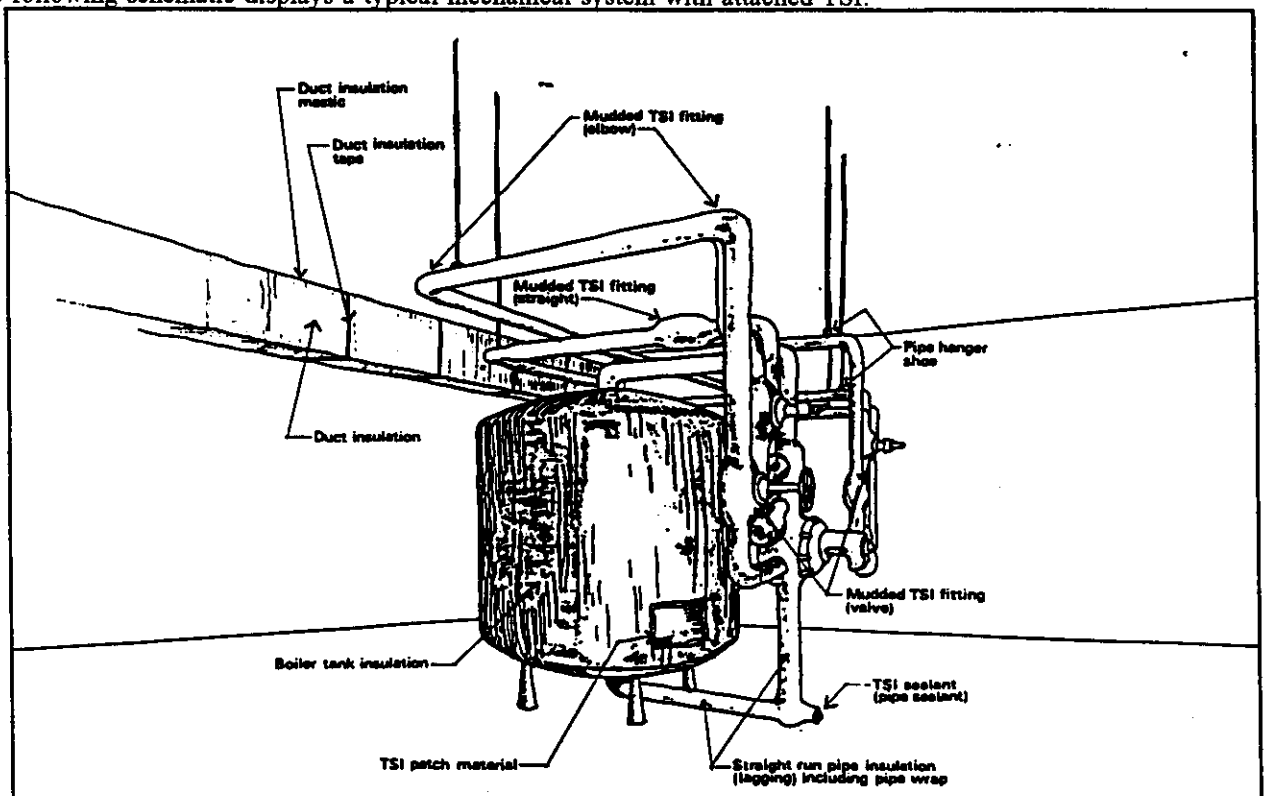
RMCI inspection and sample collection procedures are based on the Asbestos Hazard Emergency Response Act (AHERA) and Environmental Protection Agency (EPA) protocols.

An initial facility walk-through is conducted to familiarize the inspectors with the facility layout. The facility drawings are reviewed for accuracy and suspect materials are identified. The facility is then divided into functional spaces and suspect homogeneous materials are selected for bulk sampling. Samples are collected and placed into separate, sealed plastic bags. Each sample is individually numbered, and sample information is entered onto a Field Data Sheet. Sample locations are recorded on plan drawings and are shown in Facility Specific Inserts (Exhibits). Sample tools are decontaminated after each sample collection. The samples are delivered to an accredited laboratory for analysis, each accompanied by a completed Chain Of Custody Form.

Suspect materials are divided into three categories: surfacing materials (such as plaster and surface coatings), thermal system insulation (TSI) (such as mudded TSI fittings, duct insulation, and pipe insulation), and miscellaneous material (such as floor tile, drywall, and mastic). Asbestos-containing materials are classified according to:

Condition	• Good • Damaged • Significantly Damaged
Friability	• Friable • Non-friable
Potential for Disturbance	• Low Potential • Potential for Damage • Potential for Significant Damage
Disturbance Source	• Contact • Vibration • Air Flow • Water

The following schematic displays a typical mechanical system with attached TSI:



TYPICAL MECHANICAL INSTALLATION DISPLAYING VARIOUS THERMAL SYSTEM INSULATIONS (TSI)

Friable materials are materials that, when dry, can be crushed, pulverized, or reduced to powder by hand pressure. Prior to sampling, these materials are wetted with amended water to minimize potential for incidental exposure or accidental fiber release. At the inspector's discretion, personal protective equipment (PPE) is used as an added precaution.

Bulk samples are collected using EPA guidelines for the type of suspect material sampled. Where practical, sample locations are determined using random sampling methods. Within each area, samples are collected where minimal damage will occur to facility structures or finishes. A particular suspect material may be found in several different locations within a facility. The EPA does not require that these materials be sampled in each location, provided the materials are of the same type, age, appearance, have the same date of installation, and are sampled in accordance with AHERA requirements to provide statistically reliable data that can be extrapolated onto all remaining non-sampled areas.

EPA/AHERA-accredited inspectors determine the number of samples of each material to be collected, depending on the material's category and the amount of material present. The objective of the AHERA protocol is to insure statistically reliable data by requiring or suggesting a minimum number of samples to be collected and, in some cases, by requiring the use of random sampling techniques to determine sample locations. However, in every case, AHERA relies on the judgment of inspectors experienced in AHERA methodology and with the type of facility being inspected.

When necessary, tape samples may also be used to detect the presence of ACM on surfaces. This technique encompasses collecting debris on clear plastic tape and adhering the sample to a clear slide. Tape samples are analyzed by PLM.

1.3 METHOD OF LABORATORY ANALYSIS

Samples are analyzed in accordance with AHERA requirements using the following reference methods:

- EPA Interim Method for the Detection of Asbestos in Bulk Insulation Samples (EPA 600/M4-82020, December 1982).

- McCrone Research Institute's The Asbestos Particle Atlas.

All bulk samples are analyzed using PLM visual area estimation (VAE). Friable materials containing asbestos estimated at less than ten percent by PLM-VAE may be reanalyzed by PLM point counting. Additional treatment and tests may be used as required to accurately define composition (i.e., ashing, extractions, and TEM). All bulk sample laboratory reports are verified through an established quality assurance (QA) procedure. Unused portions of samples are archived for a minimum of six months.

1.4 QUALITY CONTROL PROCEDURES

All samples are analyzed by laboratories accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). These laboratories participate in the NVLAP, as well as the American Industrial Hygiene Association (AIHA) Bulk Asbestos Sample Quality Assurance Program.

A minimum of five percent of all samples collected are divided into replicates and analyzed by a laboratory other than the primary laboratory. Results from the two laboratories are compared for consistency and are included in inserts for each facility.

RMCI verifies all sample data for accuracy by cross-referencing Field Data Sheets, Chain Of Custody Forms, and field notes.

1.5 DETERMINATION OF ACM CLASSIFICATION

The positive identification of asbestos in a material or product can only be made through laboratory analysis. Visual inspection or common knowledge is not a positive test. The asbestos content of a suspect material is determined by collecting a bulk sample and having it analyzed by PLM. The PLM technique determines the specific type of asbestos present in the bulk sample and VAE provides an estimate of the percentage of asbestos.

The EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) - National Emission Standard for Asbestos (40 CFR Part 61, Subpart M) defines a non-friable asbestos-containing material as any material with an asbestos content greater than one percent as determined by PLM analysis. A friable material estimated to contain less than ten percent asbestos as determined by PLM-VAE must be analyzed by PLM point counting and determined to contain less than one percent asbestos in order to be considered a non-regulated ACM.

A clarification memorandum issued by the EPA regarding the NESHAP regulation included the following statement:

> "The parties legally responsible for a building (owner or operator) may take a conservative approach to being regulated by the NESHAP. The responsible party may choose to act as though the building material is an asbestos-containing material (greater than 1%) at any level of asbestos content (even less than 1% asbestos). Thus, if the analyst detects asbestos in the sample and estimates the amount to be less than 10% by visual estimation, the parties legally responsible (owner or operator) of the building may (1) elect to assume the amount to be greater than 1% and treat the material as regulated asbestos-containing material or (2) require verification of the amount by point counting."

In consideration of this statement, RMCI and the FAA agree that, in most cases, suspect material samples containing less than ten percent, but more than one percent asbestos as determined by PLM-VAE are, for the purpose of this report, considered to be ACM. No distinction will be made between these materials and those classified as ACM by EPA definition. However, in most cases, material samples with an asbestos content of one percent or less as determined by PLM-VAE are classified as "assumed ACM" and are so addressed in this report. At the discretion of RMCI or the FAA, materials either "considered" or "assumed" ACM may be analyzed by PLM point counting to provide a more definitive result regarding the percentage of asbestos content.

1.6 INSPECTION LIMITS

All accessible interior spaces and rooms owned, occupied, and/or maintained by the FAA, located in structures falling within RMCI's scope of work, are inspected for asbestos-containing materials. Facility roofs and attached exterior surfaces of FAA-owned facilities are also inspected. Bulk samples of roofs and exterior surfaces are collected only if damage to the substrates can be avoided, or if specifically requested by FAA personnel. Fire doors, which may contain suspect insulation materials, are normally identified by fire-rating labels adhered to the doors. However, due to labeling inconsistencies and the inaccessibility of the doors' interiors, all doors are considered to be fire doors and are only sampled when damage to the doors can be avoided (refer to Section 2.1.1 and facility-specific recommendations). Also, RMCI does not inspect underground conduit, electrical systems, or, unless specifically requested to do so, any appurtenances or above-ground structures that do not directly support the primary facility.

In areas not owned, maintained, or occupied by the FAA, but where FAA personnel require access, the asbestos-containing material inspection is limited to photo and field documentation unless these areas contained heating, ventilation, and air conditioning (HVAC) equipment or other conditions that, in the judgment of the inspector, could affect FAA personnel. In these cases, RMCI samples the suspect ACM. Roofs and exteriors of facilities not owned by the FAA are photographed and documented, but no samples are collected.

2.1 INTRODUCTION

This section discusses inspection findings and analytical results for suspect asbestos-containing material sampled at the Annette Island Station. The potential for asbestos fiber release and recommendations for future action are presented for all ACM identified. Representative samples of suspect materials were sent to an accredited laboratory for analysis. The following are included in the "Facility-Specific Inserts" sub-section for each building:

- **Data Summary Table** -- provides additional inspection data and cross-reference information relevant to suspect materials identified in each room; and potential for asbestos fiber release, recommendations for future action, and quantities are presented for all ACM identified
- **Photographs** -- representative pictures of the facilities showing suspect materials and locations
- **Exhibits** -- plans and approximate sample and ACM locations displayed on facility drawings
- **Laboratory Results** -- bulk sample and QA analysis results

Appendices for this report are as follows:

- **Appendix A - Uses and Classifications of Asbestos Products** -- information regarding the types, uses, and health effects of asbestos
- **Appendix B - Acronym List and Glossary** -- list of acronyms and terms used in this report

All accessible rooms, corridors, stairs, open spaces, etc. in these facilities are considered separate functional spaces for the purpose of this inspection. Unless otherwise stated, a closet located inside a specific room is considered part of that room. All material quantities stated are approximate and are not to be used for repair, renovation, or abatement cost estimations.

2.1.1 Statement of Inaccessibility

During the site visit, the VOR Building roof was inaccessible for inspection due to equipment in use. Suspect materials may be encountered during repair or renovation. With the exception of the metal door on the vehicle storage building, all doors throughout the facilities are assumed to be fire doors, which may contain suspect insulation materials (refer to facility-specific recommendations). These materials should be assumed ACM until sample collection and subsequent analysis prove otherwise.

2.2 INSPECTION DATE AND INSPECTOR INFORMATION

The Annette Island Station was inspected on August 3, 1994 by RMCI employees, Esther Skov, Industrial Hygiene Technician; and Barbara Leon, Industrial Hygiene Technician. Both inspectors are EPA/AHERA trained and accredited.

2.3 FACILITY INFORMATION

Annette Island Station consists of the following buildings:

- Non-Directional Beacon Building (NDB-413)
- Vehicle Storage Building (SB-200)
- VHF Omnidirectional Range Building (VOR-412)

The combined Annette Island facilities measure approximately 1,488 square feet. A site vicinity drawing follows.

A382-2-033 12/12/94

CHESTER LAKE

PORT CHESTER

VEHICLE STORAGE (200)

METLAKATA

TAMGAS HARBOR

VORTAC
91.82 ACRES

AIRPORT AREA

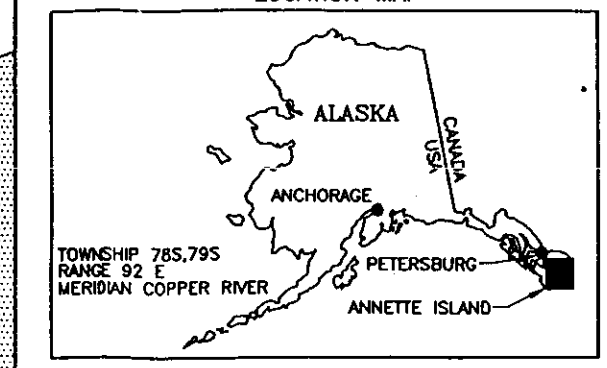
SMUGGLER COVE

CANOE COVE

T78S
T79S

R92E
R91E

LOCATION MAP



LEGEND

——— = PROPERTY FORMERLY LEASED BY FAA
----- = PROPERTY CURRENTLY LEASED BY FAA

ANNETTE ISLAND FAA STATION

0 .5 0.5 1 MILE

SCALE: 1"=0.5 MILES

N

NOTE: MAP ADAPTED BY RMCI FROM DRAWING GENERATED BY ECOLOGY AND ENVIRONMENT; STATION REAL ESTATE MAP ANNETTE ISLAND.

ASBESTOS SURVEY
ANNETTE ISLAND STATION, ALASKA

RMCI RESEARCH MANAGEMENT CONSULTANTS, INC.
California • Colorado • Virginia • Georgia
3190 South Wadsworth Blvd - Suite 100
Lakewood, Colorado 80227
(303) 969-8778 FAX (303) 969-8929

Date: 12/12/94
Drawn By: WHT
Checked By:

Exhibit
1 of 1

A362-2-033

NDB BUILDING (413)

2.4 NDB BUILDING (413)

2.4.1 Description

The NDB Building was commissioned in 1984. The prefabricated plastic building ("plastidome") is mounted on steel beams, and rests on wood supports. The roof is also plastic. The interior is finished with floor tile. A baseboard heater is used to heat the facility.

The NDB Building measures approximately 64 square feet and consists of an equipment room. The roof also measures approximately 64 square feet.

2.4.2 Suspect Material Summary

The following suspect material was identified in the NDB Building (no suspect material was identified on the exterior):

- floor tile and associated mastic

2.4.3 Asbestos-Containing Material

The following ACM was identified in the NDB Building. Unless otherwise noted, the materials were in good condition at the time of inspection (see Data Summary Table - Facility-Specific Inserts):

- Equipment Room
  - 64 square feet of non-friable 1 ft x 1 ft tan floor tile; chrysotile asbestos; the associated mastic is non-ACM

2.4.4 Facility-Specific Recommendations

The following are recommendations for ACM identified in the NDB Building. Materials assumed asbestos-containing should be sampled by trained personnel and analyzed by an accredited laboratory prior to removal or alteration. Unless planned renovations, repairs, damaged ACM, or the potential for damage require such actions, it is recommended that the ACM identified in this report not be disturbed or removed. If the ACM must be disturbed or removed for any reason, personal protective equipment and properly trained personnel must be utilized. Alterations to or the removal of asbestos-containing materials requires adherence to all applicable federal, state, and local regulations concerning the removal and disposal of asbestos materials. Periodic condition inspections are recommended until the materials are removed.

2.4.4.1 Friable Asbestos-Containing Material

No friable ACM was identified at this facility.

2.4.4.2 Non-friable Asbestos-Containing Material

Fire doors are classified as non-friable as long as the veneer of the doors remains intact and undisturbed. The insulation located at the core of a fire door is classified as friable. If the door veneer is cut, drilled, or penetrated in any manner, asbestos fibers could be released. Fire doors are normally identified by the fire-rating labels adhered to the doors. Because the labels are not always present, some fire doors may not be identified. The fire door in this facility was not sampled to avoid administering damage and is assumed to be asbestos-containing. Therefore, prior to cutting, drilling, or in any way penetrating this door, the insulation should be sampled and analyzed for asbestos content.

Floor tiles are classified as non-friable materials. These materials can become friable when in severely damaged and/or dry conditions. Care should be exercised when cleaning floor tile surfaces. A wet cleaning or polishing agent should always be used when buffing is performed. Abrasive actions, such as dry buffing, drilling, grinding, hammering, sawing, etc., should not be performed unless proper precautions are followed.

2.4.5 Facility-Specific Inserts

A data summary table, photographs, exhibits, and laboratory results follow.

DATA SUMMARY TABLE

AND COLUMN DEFINITIONS

DATA SUMMARY TABLE COLUMN DEFINITIONS

The Data Summary Table lists these columns in the following order:

1. **RECORD NUMBER** - is the sequential number representing each row of data.

2. **LOC ID** (Location Identifier) - reflects a specific identifier unique to the facility.

3. **FLOOR** - indicates the floor on which the inspection, sampling, and assessment occurred.

4. **ROOM DESCRIPTION** - is the type or name of the room, usually based on use.

5. **MATERIAL DESCRIPTION** - is the type of building material inspected and assessed.

6. **SAMPLE LOCATION** - reflects the specific building component on which suspect material is found: F = Floor, W = Wall, C = Ceiling, R = Roof, M = Miscellaneous

7. **ACTUAL SAMPLE** - indicates the sample (if any) collected in the area identified by that record.

8. **REFERENCE SAMPLE** - Multiple samples of the same material often vary in asbestos content. This may be a reflection of manufacturing inconsistencies and/or mixing of materials such as mastics or spray-on insulation prior to application. For the purpose of discussion, one sample is chosen to represent the asbestos content of the suspect material. This is termed the reference sample.

9. **RELATED SAMPLES** - are all samples, other than the reference sample, collected of the same suspect material.

10. **PERCENT ASBESTOS** - reflects the total percentage of all forms of asbestos minerals contained in the reference sample.

11. **TYPE ASBESTOS** - indicates the specific type of asbestos which is identified in the reference sample: CHRY or CH = chrysotile, AMO or AM = amosite, CROC or CR = crocidolite, ANTH or AN = anthophyllite, TREM or TR = tremolite, ACT or AC = actinolite.

12. **FRIABLE** - is defined as a material that may be crumbled or reduced to powder by hand pressure.

13. **POTENTIAL FOR DISTURBANCE** - indicates the likelihood of ACM being disturbed in the future, related to: 1) the frequency of contact between the ACM and human activity, 2) location of ACM with respect to vibration sources, and 3) the potential for air erosion. Three categories exist under AHERA: 1) "Potential for Significant Damage" (PSD), 2) "Potential for Damage" (PD), and 3) "Low Potential" (LP).

14. **DISTURBANCE SOURCE** - reflects the type of condition or action which may disturb the ACM. Under AHERA, four types of disturbance exist: 1) physical contact with material (C), 2) vibration influence (V), 3) air erosion (A), and 4) water erosion and/or influence (W).

15. **CONDITION** - is a description of the physical condition of the ACM based on a visual inspection. AHERA defines three categories: 1) "Good Condition" (G), 2) "Damaged" (D), and 3) "Significantly Damaged" (SD).

16. **HAZARD RANK** - is a computer-generated numerical score which provides the management planner with a qualitative tool for selecting an appropriate response action. In addition, the Hazard Rank allows the FAA to compare, in a relative way, the condition of different facilities in different locations. A score of "1" indicates a low hazard, while a score of "7" indicates a significant hazard. The method used to rank facilities follows the AHERA Categorizing of Assessed Material with a few notable exceptions.

    Both AHERA and this ranking system evaluate material on the basis of its condition and potential for disturbance. However, AHERA only addresses friable material. The presence of non-friable ACM is documented, but it is not assessed. Non-friable ACM is included in the Hazard Rank. AHERA also categorizes on the basis of material type (surfacing, TSI, or miscellaneous). This is not appropriate for determination of the Hazard Rank since all material types present similar concerns. In summary, the Hazard Rank considers friability, condition, and potential for disturbance in its calculation.

17. **RECOMMENDED ACTION** - describes the type of activity recommended to respond to the presence of asbestos within the facility. Recommended actions are as follows:

    Action 1: **O&M Deferred** - maintain material in good condition and monitor for deterioration of material

    Action 2: **O&M Abatement** - remove, repair, enclose or encapsulate all damaged ACM to mitigate potential release

    Action 3: **Emergency O&M Abatement** - evacuate and isolate the area; remove, repair, enclose, or encapsulate all damaged ACM; and clean all potentially contaminated areas

    Action 4: **Full-Scale Emergency Abatement** - evacuate and isolate the area, abate all damaged ACM via a full-scale abatement operation, and clean all potentially contaminated areas

18. **APPROXIMATE QUANTITY OF MATERIAL/ROOM** - is the total estimated quantity of ACM in the room.

19. **FUNCT SPACE** (Functional Space) - is not used by RMCI.

20. **COMMENTS** - includes additional information (if any).

ANNETTE ISLAND STATION
DATA SUMMARY TABLE

Record Number	Loc ID	Floor Number	Building	Room Description	Material Description	Sample Location	Actual Sample	Reference Sample	Related Samples
1	ANN	1.0	NDB	EQUIPMENT ROOM	1 FT X 1 FT TAN FLOOR TILE	F	1-14M	1-14M	1-15M
2	ANN	1.0	NDB	EQUIPMENT ROOM	1 FT X 1 FT TAN FLOOR TILE MASTIC	F	1-14M	1-14M	1-15M
3	ANN	1.0	NDB	EQUIPMENT ROOM	1 FT X 1 FT TAN FLOOR TILE	F	1-15M	1-14M	SEE COMMENTS
4	ANN	1.0	NDB	EQUIPMENT ROOM	1 FT X 1 FT TAN FLOOR TILE MASTIC	F	1-15M	1-14M	1-15M
5	ANN	1.0	NDB	EXTERIOR/ROOF	SEE COMMENTS				
6	ANN	99.0	NDB	FACILITY	FIRE DOOR	M			SEE COMMENTS

For Sample Location: F = Floor C = Ceiling W = Wall R = Roof M = Miscellaneous Sample Numbers: P = Previous Inspection
Floor Numbers: 0.0 = Base Building 0.4 = Mechanical Level 0.5 = Tower Basement Level 0.9 = Building Exterior 90.0+ = Detached Buildings and Trailers 99.0 = Facility

ANNETTE ISLAND STATION
DATA SUMMARY TABLE

Record Number	Percent Asbestos	Asbestos Type	Friable	Potential for Distrubance	Disturbance Source	Condition	Hazard Ranking	Recommended Action	Approx Quantity of Material in Room	Cost Estimate	Comments
1	12.0	CHRY	N	LP	C	G	1	1	64 SQ FT	0.00	
2										0.00	
3										0.00	REFLECTED BY ACTUAL SAMPLE 1-14M
4										0.00	
5										0.00	NO SUSPECT MATERIALS
6			N	LP	C	G	1	1	1 DOOR	0.00	NOT SAMPLED TO AVOID DAMAGE; ASSUME ACM

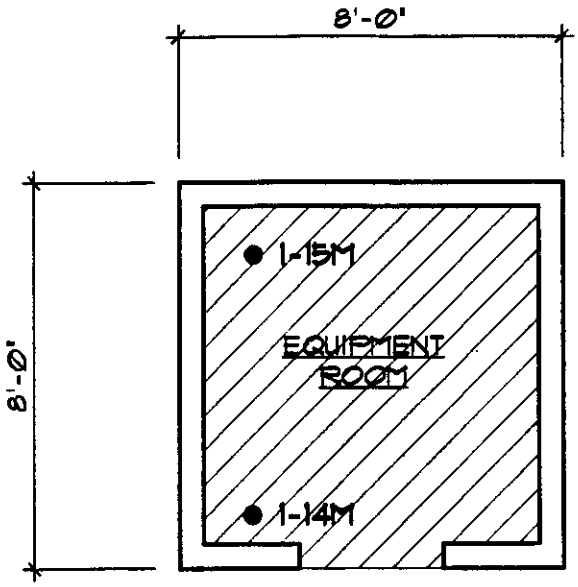
For Percent Asbestos: TR = Trace

PHOTOS

1) View of the Annette Island NDB Building (413). August 1994

EXHIBITS

A362-033/ANN-NDB 12/12/94



FLOOR PLAN
1/4"=1'-0"

INDICATES AREAS WITH ACM FLOOR TILE ONLY

SAMPLE ID REFERENCE #
ANN (LOC. ID) – NDB (BLD'G. ID)

SCHEDULE OF SAMPLES
- ● = FLOOR
- ▲ = WALL
- ♦ = CEILING
- ■ = ROOF
- ○ = MISCELLANEOUS
- * = MULTIPLE SAMPLE LOCATION

NOTE:
FIRE DOOR WAS NOT SAMPLED TO AVOID DAMAGE; ASSUME ACM.

NON-DIRECTIONAL BEACON BUILDING #413 ASBESTOS SURVEY ANNETTE ISLAND STATION, ALASKA	Date: 12/12/94 Drawn By: WHT	Check. By:

Exhibit 1 of 3

RMCI RESEARCH MANAGEMENT CONSULTANTS, INC.
California Colorado Virginia Georgia
3190 South Wadsworth Blvd – Suite 100
Lakewood, Colorado 80227
(303) 969-8778 FAX (303) 969-8929

A362-033

LABORATORY RESULTS

NVLAP LAB NO. 1896

AIHA NO. 480

ASBESTOS IDENTIFICATION AND QUANTIFICATION
-POLARIZED LIGHT MICROSCOPY
-PHASE CONTRAST MICROSCOPY
-TRANSMISSION/SCANNING ELECTRON MICROSCOPY
-ENERGY DISPERSIVE SPECTROSCOPY
-X-RAY DIFFRACTION

RESERVOIRS ENVIRONMENTAL SERVICES, INC.

1827 GRANT STREET DENVER, COLORADO 80203 (800) 678-7374 (303) 830-1986

March 19, 1993

Mr. Ron Rosso
RMCI
3190 South Wadsworth Blvd., Suite 100
Lakewood, CO

Dear Mr. Rosso:

Reservoir's policy is to retain all samples for a minimum of sixty days. In practice, however we do not dispose of samples for at least one year. We offer our clients the option of having the samples returned or having them properly disposed of as asbestos containing material.

For major projects we can offer indefinite storage. The RMCI project for the FAA certainly qualifies as a major project and we can archive the samples indefinitely or automatically return them to you after one year.

Please let us know if you wish to have your samples returned after one year, stored for a longer period or disposed.

Sincerely,

Robert K. Dickson
Assistant Division Manager

NVLAP LAB NO. 1896

ASBESTOS - TEM, PCM, PLM, SEM
METALS - AA, FLAME/FURNACE
AIRBORNE PARTICULATES
SPECIAL PARTICLE ANALYSIS

AIHA LAB I.D. 10768

RESERVOIRS ENVIRONMENTAL
SERVICES, INC.

1827 GRANT STREET DENVER, COLORADO 80203 (800) 678-7374 (303) 830-1986 FAX (303) 863-9196

August 11, 1994

Ms. Esther Skov
RMCI
3190 Wadsworth Boulevard, Suite 100
Lakewood, CO 80227

RE: Job No. RES 21395B - A160-2-053/055/057, V3-94-11969 ANN - Bulk Samples: ANN-NDB-1-14M and ANN-NDB-1-15M.

Dear Ms. Skov:

Reservoirs Environmental Services, Inc. (RES, Inc.) has analyzed two bulk material samples by Polarized Light Microscopy (PLM) for asbestos content as per your request. The samples were received on August 5, 1994, and initial results were telephoned to your office on August 10, 1994. PLM was used to analyze the bulk materials in compliance with guidelines established by the USEPA (40 CFR Part 763, Subpart F, Appendix A). The Analytical Results are presented in Table I.

RES, Inc. has assigned job number RES 21395B to this study. This report is considered highly confidential and the sole property of RMCI. RES, Inc. will not discuss any part of this study with personnel other than those of the client company. Samples will be disposed of after sixty days unless longer storage is requested. The US EPA guideline (40 CFR Part 763, Subpart F, Appendix A) was developed for use on friable building materials and is not recommended for non-friable materials such as floor tiles. RES, Inc. recommends additional analyses to confirm negative PLM results on floor tiles.

If you should have any questions about this report, please feel free to call me at 830-1986.

Sincerely,

Jeanne Spencer Orr
Vice President

RKD/cma

Analyst(s):
Cheryl A. Dempsey
Greg Behnfeldt
Patrick Coughlan
Paul D. Lo Scalzo
Robert L. Gault

RESERVOIRS ENVIRONMENTAL SERVICES, INC.

NVLAP Accredited Laboratory #1896

TABLE I. PLM BULK ANALYSIS, PERCENTAGE COMPOSITION BY VOLUME

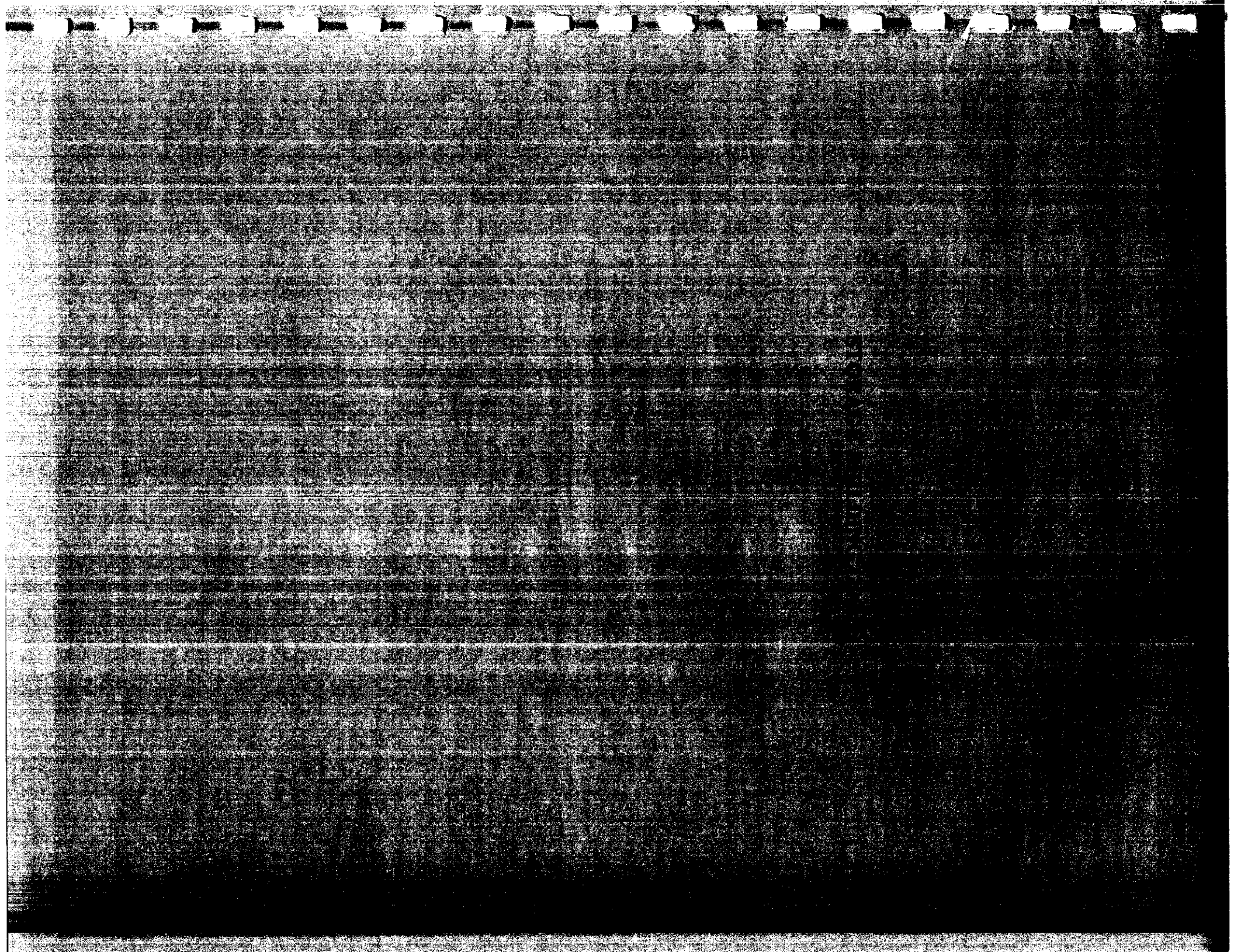
RES Job Number: **RES 21395B**
Client: **RMCI**
Client Project: **A160-2-053/055/057, V3-94-11969 ANN**
Date Samples Received: **August 5, 1994**
Analysis Type: **PLM Short Report**
Turnaround: **3-5 Day**

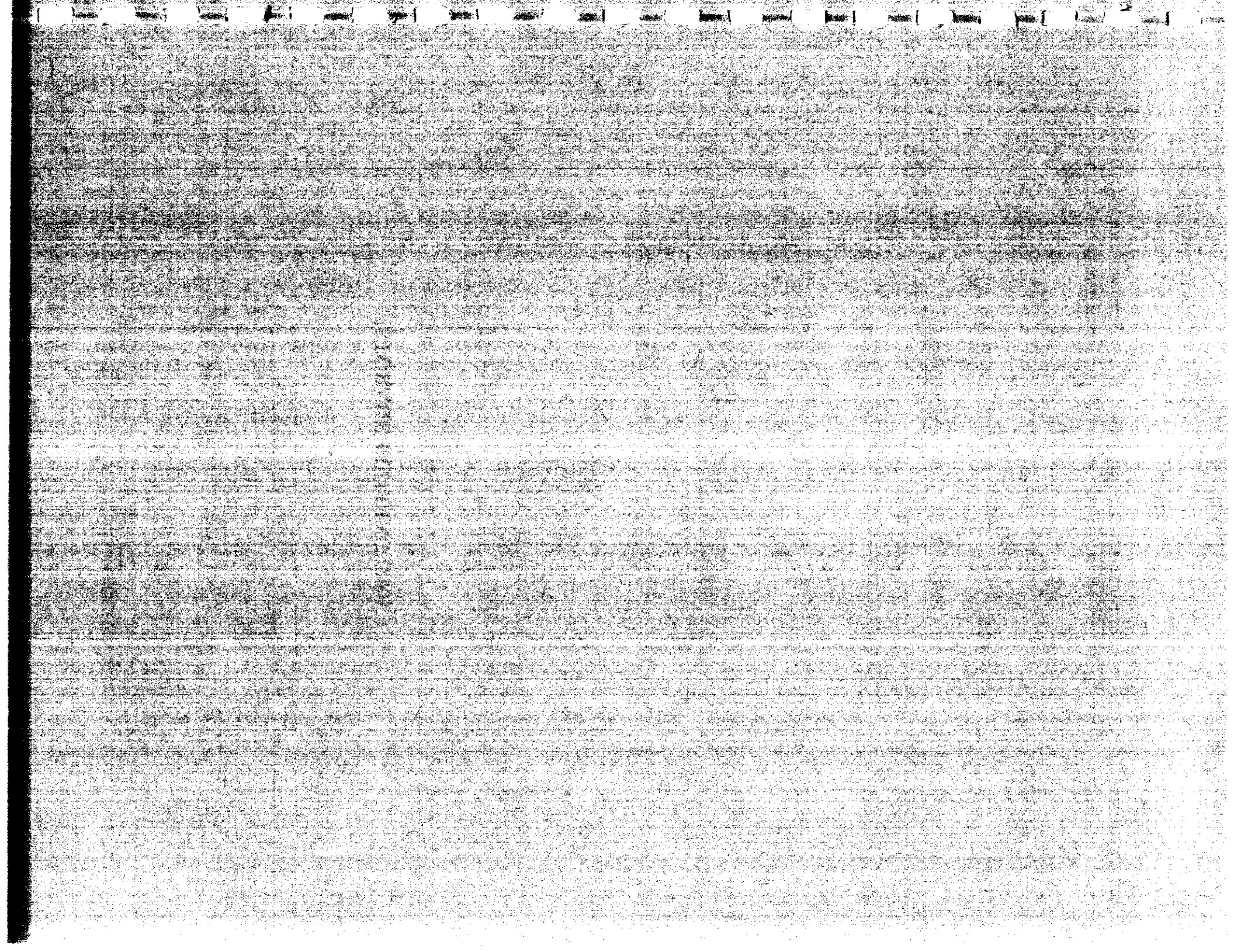
Client Sample Number	Lab ID Number	TOTAL ASBESTOS (%)	Layer	Physical Description	Portion of Total Sample (%)	ASBESTOS CONTENT BY LAYER Mineral	Visual Estimate (%)	Non-Asbestos Fibrous Components (%) CELL	GLASS	SYNTH	HAIR	WOLL	TALC	OTHER	Non-Fibrous Components (%)
ANN-NDB-1-14M	EM 133595	**11.6**	A	Tan resin	3		ND	TR	0	0	0	0	0	0	100
1x1 Tan Floor Tile/Mastic			B	Tan & brown tile	97	**Chrysotile**	12	0	0	0	0	0	0	0	88
ANN-NDB-1-15M	EM 133596	**2.9**	A	Tan resin	3		ND	TR	0	0	0	0	0	0	100
1x1 Tan Floor Tile/Mastic			B	White tile	97	**Chrysotile**	3	0	0	0	0	0	0	0	97

ND = None Detected
TR = Trace
CELL = Cellulose
Mat = Material
ORG = Organic
BRUC = Brucite
WOLL = Wollastonite
Trem-Act = Tremolite-Actinolite
GYP = Gypsum
SYNTH = Synthetic

Analyst: BG

Data QA





2.5 VEHICLE STORAGE BUILDING (200)

2.5.1 Description

The Vehicle Storage Building was commissioned in 1980. The building is a storage shed constructed of metal, including the roof, and rests directly on the ground. The facility has no interior finishes and no HVAC system.

The Vehicle Storage Building measures approximately 128 square feet and consists of a storage room. The roof also measures approximately 128 square feet.

2.5.2 Suspect Material Summary

No suspect material was identified in/on the Vehicle Storage Building.

2.5.3 Asbestos-Containing Material

No ACM was identified in/on the Vehicle Storage Building.

2.5.4 Facility-Specific Recommendations

No ACM was identified in/on the Vehicle Storage Building; therefore, no recommendations are required.

2.5.5 Facility-Specific Inserts

A data summary table, photographs, exhibits, and laboratory results follow.

DATA SUMMARY TABLE

AND COLUMN DEFINITIONS

DATA SUMMARY TABLE COLUMN DEFINITIONS

The Data Summary Table lists these columns in the following order:

1. **RECORD NUMBER** - is the sequential number representing each row of data.

2. **LOC ID** (Location Identifier) - reflects a specific identifier unique to the facility.

3. **FLOOR** - indicates the floor on which the inspection, sampling, and assessment occurred.

4. **ROOM DESCRIPTION** - is the type or name of the room, usually based on use.

5. **MATERIAL DESCRIPTION** - is the type of building material inspected and assessed.

6. **SAMPLE LOCATION** - reflects the specific building component on which suspect material is found: F = Floor, W = Wall, C = Ceiling, R = Roof, M = Miscellaneous

7. **ACTUAL SAMPLE** - indicates the sample (if any) collected in the area identified by that record.

8. **REFERENCE SAMPLE** - Multiple samples of the same material often vary in asbestos content. This may be a reflection of manufacturing inconsistencies and/or mixing of materials such as mastics or spray-on insulation prior to application. For the purpose of discussion, one sample is chosen to represent the asbestos content of the suspect material. This is termed the reference sample.

9. **RELATED SAMPLES** - are all samples, other than the reference sample, collected of the same suspect material.

10. **PERCENT ASBESTOS** - reflects the total percentage of all forms of asbestos minerals contained in the reference sample.

11. **TYPE ASBESTOS** - indicates the specific type of asbestos which is identified in the reference sample: CHRY or CH = chrysotile, AMO or AM = amosite, CROC or CR = crocidolite, ANTH or AN = anthophyllite, TREM or TR = tremolite, ACT or AC = actinolite.

12. **FRIABLE** - is defined as a material that may be crumbled or reduced to powder by hand pressure.

13. **POTENTIAL FOR DISTURBANCE** - indicates the likelihood of ACM being disturbed in the future, related to: 1) the frequency of contact between the ACM and human activity, 2) location of ACM with respect to vibration sources, and 3) the potential for air erosion. Three categories exist under AHERA: 1) "Potential for Significant Damage" (PSD), 2) "Potential for Damage" (PD), and 3) "Low Potential" (LP).

14. **DISTURBANCE SOURCE** - reflects the type of condition or action which may disturb the ACM. Under AHERA, four types of disturbance exist: 1) physical contact with material (C), 2) vibration influence (V), 3) air erosion (A), and 4) water erosion and/or influence (W).

15. **CONDITION** - is a description of the physical condition of the ACM based on a visual inspection. AHERA defines three categories: 1) "Good Condition" (G), 2) "Damaged" (D), and 3) "Significantly Damaged" (SD).

16. **HAZARD RANK** - is a computer-generated numerical score which provides the management planner with a qualitative tool for selecting an appropriate response action. In addition, the Hazard Rank allows the FAA to compare, in a relative way, the condition of different facilities in different locations. A score of "1" indicates a low hazard, while a score of "7" indicates a significant hazard. The method used to rank facilities follows the AHERA Categorizing of Assessed Material with a few notable exceptions.

    Both AHERA and this ranking system evaluate material on the basis of its condition and potential for disturbance. However, AHERA only addresses friable material. The presence of non-friable ACM is documented, but it is not assessed. Non-friable ACM is included in the Hazard Rank. AHERA also categorizes on the basis of material type (surfacing, TSI, or miscellaneous). This is not appropriate for determination of the Hazard Rank since all material types present similar concerns. In summary, the Hazard Rank considers friability, condition, and potential for disturbance in its calculation.

17. **RECOMMENDED ACTION** - describes the type of activity recommended to respond to the presence of asbestos within the facility. Recommended actions are as follows:

    Action 1: **O&M Deferred** - maintain material in good condition and monitor for deterioration of material

    Action 2: **O&M Abatement** - remove, repair, enclose or encapsulate all damaged ACM to mitigate potential release

    Action 3: **Emergency O&M Abatement** - evacuate and isolate the area; remove, repair, enclose, or encapsulate all damaged ACM; and clean all potentially contaminated areas

    Action 4: **Full-Scale Emergency Abatement** - evacuate and isolate the area, abate all damaged ACM via a full-scale abatement operation, and clean all potentially contaminated areas

18. **APPROXIMATE QUANTITY OF MATERIAL/ROOM** - is the total estimated quantity of ACM in the room.

19. **FUNCT SPACE** (Functional Space) - is not used by RMCI.

20. **COMMENTS** - includes additional information (if any).

ANNETTE ISLAND STATION
DATA SUMMARY TABLE

Record Number	Loc ID	Floor Number	Building	Room Description	Material Description	Sample Location	Actual Sample	Reference Sample	Related Samples
7	ANN	1.0	SB	EXTERIOR/ROOF	SEE COMMENTS				
8	ANN	1.0	SB	STORAGE ROOM	SEE COMMENTS				

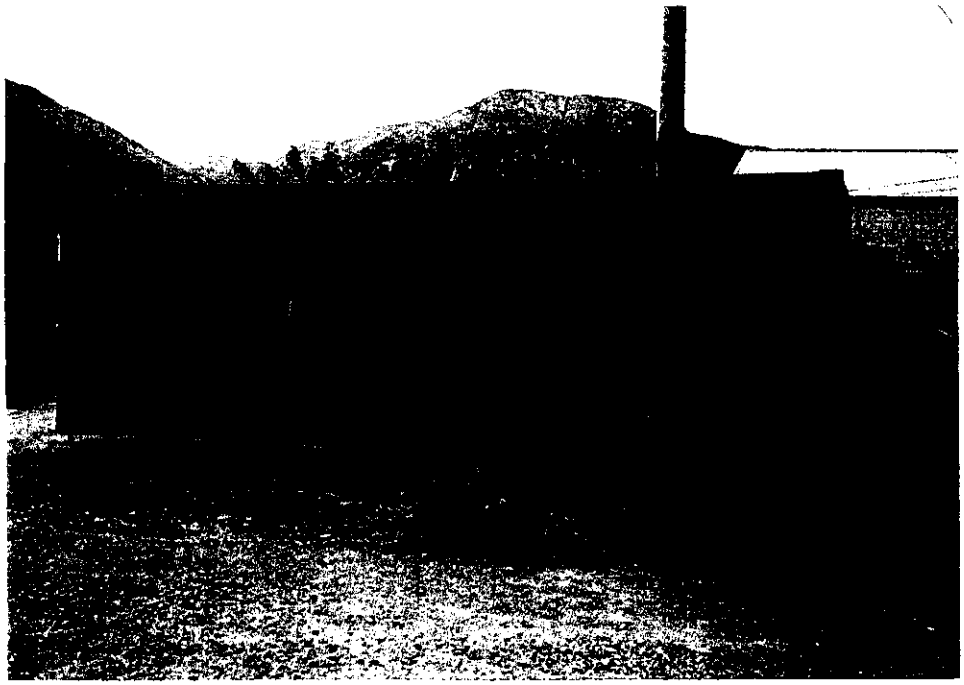
For Sample Location: F = Floor C = Ceiling W = Wall R = Roof M = Miscellaneous Sample Numbers: P = Previous Inspection
Floor Numbers: 0.0 = Base Building 0.4 = Mechanical Level 0.5 = Tower Basement Level 0.9 = Building Exterior 90.0+ = Detached Buildings and Trailers 99.0 = Facility

ANNETTE ISLAND STATION
DATA SUMMARY TABLE

Record Number	Percent Asbestos	Asbestos Type	Friable	Potential for Distrubance	Disturbance Source	Condition	Hazard Ranking	Recommended Action	Approx Quantity of Material in Room	Cost Estimate	Comments
7										0.00	NO SUSPECT MATERIALS
8										0.00	NO SUSPECT MATERIALS

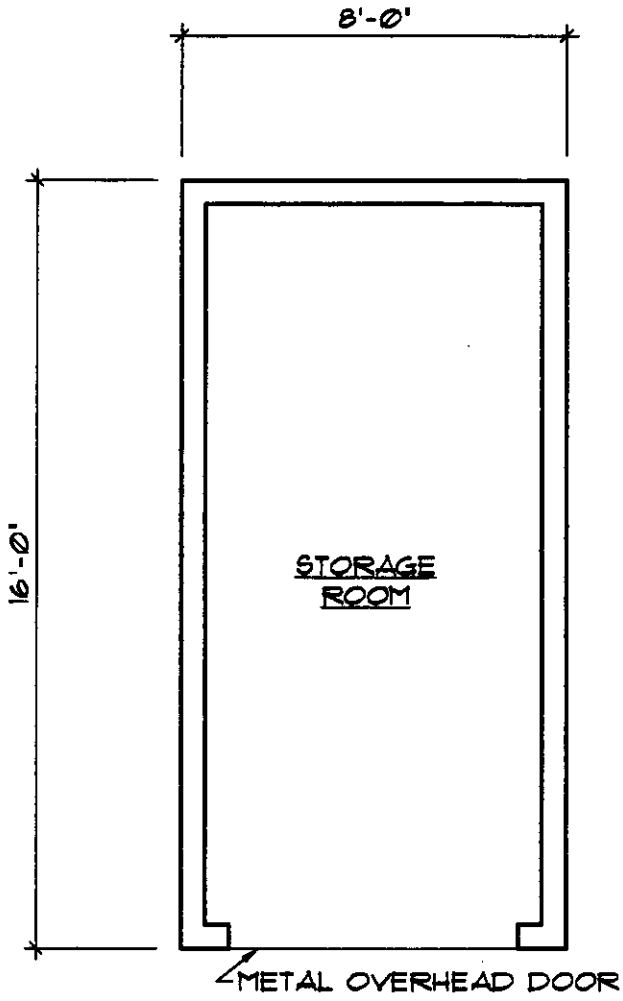
For Percent Asbestos: TR = Trace

PHOTOS



1) View of the Annette Island Vehicle Storage Building (200). August 1994

A362-033/ANN-SB 12/12/94



FLOOR PLAN
1/8" = 1'-0"

N

NOTE:
NO SUSPECT MATERIALS IDENTIFIED

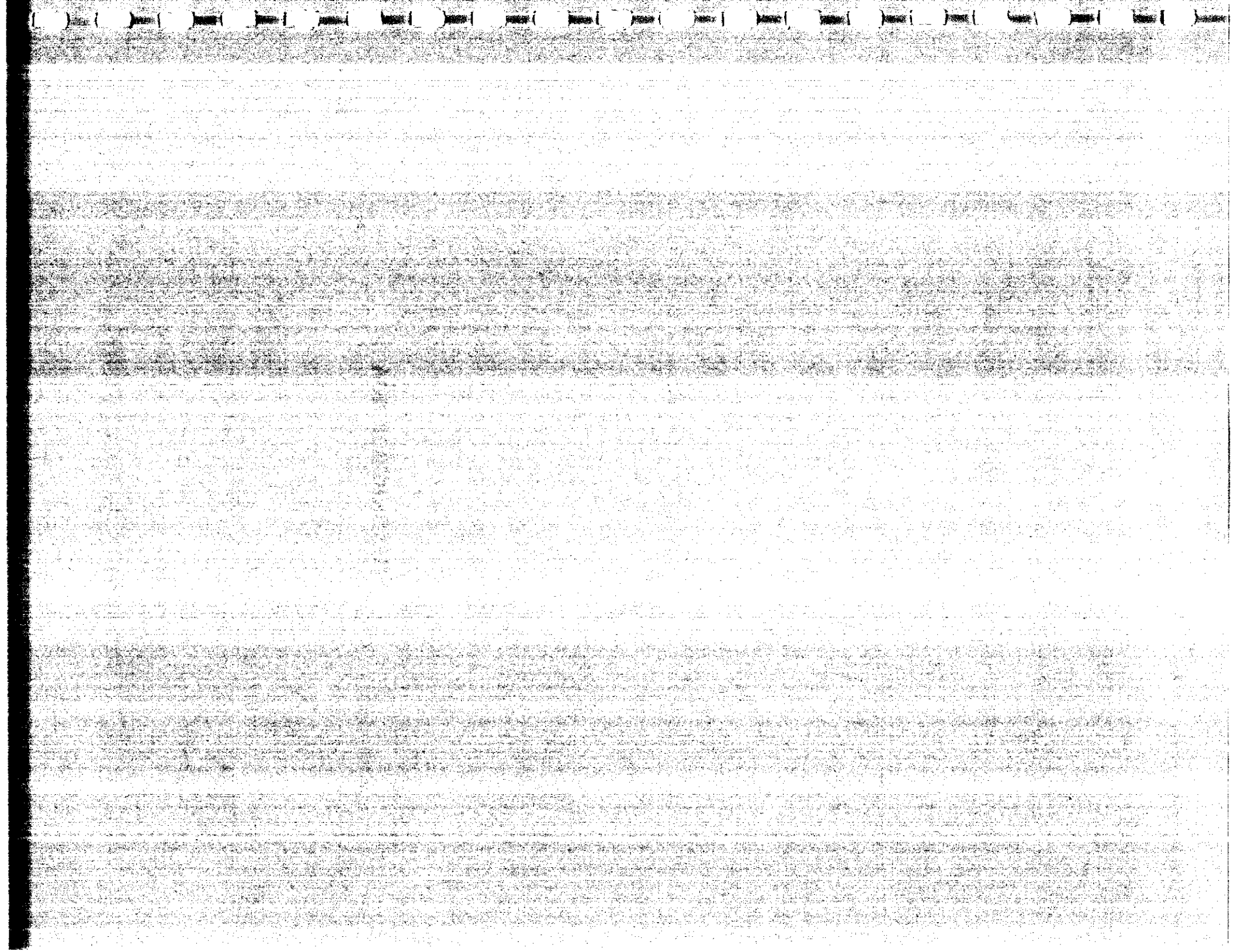
SAMPLE ID REFERENCE #
ANN (LOC. ID) – SB (BLD'G. ID)

VEHICLE STORAGE BUILDING #200 ASBESTOS SURVEY ANNETTE ISLAND STATION, ALASKA	Date: 12/12/94 Drawn By: WHT	Check. By:	Exhibit 2 of 3

RMCI RESEARCH MANAGEMENT CONSULTANTS, INC.
California Colorado Virginia Georgia
3190 South Wadsworth Blvd – Suite 100
Lakewood, Colorado 80227
(303) 969-8778 FAX (303) 969-8929

A362-033

OR BUILDING (412)



2.6 VOR BUILDING (412)

2.6.1 Description

The VOR Building was commissioned in 1963. The building is constructed of concrete block, and rests on a concrete foundation. During the site visit, the roof was inaccessible for inspection due to equipment in use. Interior finishes include floor tile, baseboard, and drywall. According to FAA personnel, the interior partition walls which separate the equipment room, breakroom, and storage room were added in 1992. The ACM drywall joint compound is associated with the original drywall located only on the perimeter walls and ceiling. An air handling unit (AHU) located on the exterior services the facility.

The VOR Building measures approximately 1,296 square feet and consists of a breakroom, engine generator (EG) room, equipment room, and storage room. The roof measures approximately 2,056 square feet.

2.6.2 Suspect Material Summary

The following suspect material was identified at the VOR Building:

- baseboard mastic
- drywall
- drywall joint compound
- floor tile and associated mastic
- gaskets
- roofing materials

2.6.3 Asbestos-Containing Material

The following ACM was identified at the VOR Building. Unless otherwise noted, the materials were in good condition at the time of inspection (see Data Summary Table - Facility-Specific Inserts):

- Breakroom
  - 284 square feet of non-friable mastic associated with the 1 ft x 1 ft tan floor tile; chrysotile asbestos; the floor tile is non-ACM
  - non-friable drywall joint compound where present on original walls and ceiling; chrysotile asbestos
- EG Room
  - non-friable drywall joint compound where present on original walls and ceiling; chrysotile asbestos
  - non-friable gaskets where present on engine generator; not sampled to avoid damage, assume ACM

- Equipment Room
  - 10 square feet of non-friable 1 ft x 1 ft brown floor tile within equipment rack; chrysotile asbestos; the associated mastic is non-ACM
  - 646 square feet of non-friable mastic associated with the 1 ft x 1 ft tan floor tile; chrysotile asbestos; the floor tile is non-ACM
  - non-friable drywall joint compound where present on original walls and ceiling; chrysotile asbestos
- Storage Room
  - 36 square feet of non-friable mastic associated with the 1 ft x 1 ft tan floor tile; chrysotile asbestos; the floor tile is non-ACM
  - non-friable drywall joint compound where present on original walls; chrysotile asbestos
- Roof
  - 2,056 square feet of non-friable roofing materials; inaccessible, assume ACM

2.6.4 Facility-Specific Recommendations

The following are recommendations for ACM identified at the VOR Building. Materials assumed asbestos-containing should be sampled by trained personnel and analyzed by an accredited laboratory prior to removal or alteration. Unless planned renovations, repairs, damaged ACM, or the potential for damage require such actions, it is recommended that the ACM identified in this report not be disturbed or removed. If the ACM must be disturbed or removed for any reason, personal protective equipment and properly trained personnel must be utilized. Alterations to or the removal of asbestos-containing materials requires adherence to all applicable federal, state, and local regulations concerning the removal and disposal of asbestos materials. Periodic condition inspections are recommended until the materials are removed.

2.6.4.1 Friable Asbestos-Containing Material

No friable ACM was identified at this facility.

2.6.4.2 Non-friable Asbestos-Containing Material

Fire doors are classified as non-friable as long as the veneer of the doors remains intact and undisturbed. The insulation located at the core of a fire door is classified as friable. If the door veneer is cut, drilled, or penetrated in any manner, asbestos fibers could be released. Fire doors are normally identified by the fire-rating labels adhered to the doors. Because the labels are not always present, some fire doors may not be identified. The fire doors in this facility were not sampled to avoid administering damage and are assumed to be asbestos-containing. Therefore, prior to cutting, drilling, or in any way penetrating any of these doors, the insulation should be sampled and analyzed for asbestos content.

Floor tiles and associated mastics are classified as non-friable materials. These materials can become friable when in severely damaged and/or dry conditions. Care should be exercised when cleaning floor tile surfaces. A wet cleaning or polishing agent should always be used when buffing is performed. Abrasive actions, such as dry buffing, drilling, grinding, hammering, sawing, etc., should not be performed unless proper precautions are followed. For abatement purposes only, non-asbestos-containing floor tile is considered cross-contaminated by its asbestos-containing mastic.

Drywall joint compounds are classified as non-friable in a finished and painted state. Penetrations of these materials will cause them to become friable. Abrasive actions, such as sanding, drilling, cutting, etc., should be prohibited unless proper precautions are observed.

Gasket materials are generally classified as non-friable materials; however, when exposed to heat for extended periods of time, they will become dry and brittle, and therefore, be considered friable. Abrasive actions, such as cutting, tearing, grinding, etc., may also cause the materials to become friable and should not be performed on these materials unless proper precautions are followed. Gasket materials are typically located between two separate flat surfaces and, except for the edges, are rarely visible. The only time these materials are exposed is when maintenance procedures require their removal or repair. The gaskets on the engine generator at this facility were not sampled to avoid damage and are assumed to be asbestos-containing.

Roofing materials are classified as non-friable unless severely damaged by heat, air, or water erosion. Generally, if roofing materials are damaged to the extent that they are considered friable, the roofing system will fail and replacement will be necessary. Abrasive actions, such as cutting, drilling, grinding, etc. , should not be performed on asbestos-containing roofing materials. Roofing materials identified as suspect, but that were not sampled are assumed to be asbestos-containing and should be core-sampled prior to the performance of any maintenance or replacement procedures. The VOR Building roof was inaccessible for inspection due to equipment in use, assume ACM.

2.6.5 Facility-Specific Inserts

A data summary table, photographs, exhibits, and laboratory results follow.

DATA SUMMARY TABLE

AND COLUMN DEFINITIONS

DATA SUMMARY TABLE COLUMN DEFINITIONS

The Data Summary Table lists these columns in the following order:

1. **RECORD NUMBER** - is the sequential number representing each row of data.

2. **LOC ID** (Location Identifier) - reflects a specific identifier unique to the facility.

3. **FLOOR** - indicates the floor on which the inspection, sampling, and assessment occurred.

4. **ROOM DESCRIPTION** - is the type or name of the room, usually based on use.

5. **MATERIAL DESCRIPTION** - is the type of building material inspected and assessed.

6. **SAMPLE LOCATION** - reflects the specific building component on which suspect material is found: F = Floor, W = Wall, C = Ceiling, R = Roof, M = Miscellaneous

7. **ACTUAL SAMPLE** - indicates the sample (if any) collected in the area identified by that record.

8. **REFERENCE SAMPLE** - Multiple samples of the same material often vary in asbestos content. This may be a reflection of manufacturing inconsistencies and/or mixing of materials such as mastics or spray-on insulation prior to application. For the purpose of discussion, one sample is chosen to represent the asbestos content of the suspect material. This is termed the reference sample.

9. **RELATED SAMPLES** - are all samples, other than the reference sample, collected of the same suspect material.

10. **PERCENT ASBESTOS** - reflects the total percentage of all forms of asbestos minerals contained in the reference sample.

11. **TYPE ASBESTOS** - indicates the specific type of asbestos which is identified in the reference sample: CHRY or CH = chrysotile, AMO or AM = amosite, CROC or CR = crocidolite, ANTH or AN = anthophyllite, TREM or TR = tremolite, ACT or AC = actinolite.

12. **FRIABLE** - is defined as a material that may be crumbled or reduced to powder by hand pressure.

13. **POTENTIAL FOR DISTURBANCE** - indicates the likelihood of ACM being disturbed in the future, related to: 1) the frequency of contact between the ACM and human activity, 2) location of ACM with respect to vibration sources, and 3) the potential for air erosion. Three categories exist under AHERA: 1) "Potential for Significant Damage" (PSD), 2) "Potential for Damage" (PD), and 3) "Low Potential" (LP).

14. **DISTURBANCE SOURCE** - reflects the type of condition or action which may disturb the ACM. Under AHERA, four types of disturbance exist: 1) physical contact with material (C), 2) vibration influence (V), 3) air erosion (A), and 4) water erosion and/or influence (W).

15. **CONDITION** - is a description of the physical condition of the ACM based on a visual inspection. AHERA defines three categories: 1) "Good Condition" (G), 2) "Damaged" (D), and 3) "Significantly Damaged" (SD).

16. **HAZARD RANK** - is a computer-generated numerical score which provides the management planner with a qualitative tool for selecting an appropriate response action. In addition, the Hazard Rank allows the FAA to compare, in a relative way, the condition of different facilities in different locations. A score of "1" indicates a low hazard, while a score of "7" indicates a significant hazard. The method used to rank facilities follows the AHERA Categorizing of Assessed Material with a few notable exceptions.

    Both AHERA and this ranking system evaluate material on the basis of its condition and potential for disturbance. However, AHERA only addresses friable material. The presence of non-friable ACM is documented, but it is not assessed. Non-friable ACM is included in the Hazard Rank. AHERA also categorizes on the basis of material type (surfacing, TSI, or miscellaneous). This is not appropriate for determination of the Hazard Rank since all material types present similar concerns. In summary, the Hazard Rank considers friability, condition, and potential for disturbance in its calculation.

17. **RECOMMENDED ACTION** - describes the type of activity recommended to respond to the presence of asbestos within the facility. Recommended actions are as follows:

    Action 1: **O&M Deferred** - maintain material in good condition and monitor for deterioration of material

    Action 2: **O&M Abatement** - remove, repair, enclose or encapsulate all damaged ACM to mitigate potential release

    Action 3: **Emergency O&M Abatement** - evacuate and isolate the area; remove, repair, enclose, or encapsulate all damaged ACM; and clean all potentially contaminated areas

    Action 4: **Full-Scale Emergency Abatement** - evacuate and isolate the area, abate all damaged ACM via a full-scale abatement operation, and clean all potentially contaminated areas

18. **APPROXIMATE QUANTITY OF MATERIAL/ROOM** - is the total estimated quantity of ACM in the room.

19. **FUNCT SPACE** (Functional Space) - is not used by RMCI.

20. **COMMENTS** - includes additional information (if any).

ANNETTE ISLAND STATION
DATA SUMMARY TABLE

Record Number	Loc ID	Floor Number	Building	Room Description	Material Description	Sample Location	Actual Sample	Reference Sample	Related Samples
9	ANN	1.0	VOR	BREAKROOM	BASEBOARD MASTIC (BRN)	W		1-6M	1-7M
11	ANN	1.0	VOR	BREAKROOM	DRYWALL (NEW)	W		1-3M	
12	ANN	1.0	VOR	BREAKROOM	DRYWALL JOINT COMPOUND (NEW)	W		1-8M	1-9M
13	ANN	1.0	VOR	BREAKROOM	1 FT X 1 FT TAN FLOOR TILE	F	1- 4M	1-1M	1-1MQA/4M
14	ANN	1.0	VOR	BREAKROOM	1 FT X 1 FT TAN FLOOR TILE MASTIC	F	1- 4M	1-1MQA	1-1M/4M
15	ANN	1.0	VOR	BREAKROOM	BASEBOARD MASTIC (WHT)	W	1- 5M	1-2M	1-5M
10	ANN	1.0	VOR	BREAKROOM	DRYWALL	W/C	1-10M	1-10M	
16	ANN	1.0	VOR	BREAKROOM	DRYWALL JOINT COMPOUND	W/C	1-10M	1-11M	1-10M
17	ANN	1.0	VOR	BREAKROOM	DRYWALL JOINT COMPOUND	W/C	1-11M		SEE COMMENTS
18	ANN	1.0	VOR	EG ROOM	BASEBOARD MASTIC (BRN)	W		1-6M	1-7M
19	ANN	1.0	VOR	EG ROOM	BASEBOARD MASTIC (WHT)	W		1-2M	1-5M
20	ANN	1.0	VOR	EG ROOM	DRYWALL	W/C		1-10M	
21	ANN	1.0	VOR	EG ROOM	DRYWALL JOINT COMPOUND	W/C		1-11M	1-10M
22	ANN	1.0	VOR	EG ROOM	GASKETS	M			SEE COMMENTS
23	ANN	1.0	VOR	EQUIPMENT ROOM	1 FT X 1 FT TAN FLOOR TILE	F		1-1M	1-1MQA/4M
24	ANN	1.0	VOR	EQUIPMENT ROOM	1 FT X 1 FT TAN FLOOR TILE MASTIC	F		1-1MQA	1-1M/4M
25	ANN	1.0	VOR	EQUIPMENT ROOM	BASEBOARD MASTIC (WHT)	W		1-2M	1-5M
26	ANN	1.0	VOR	EQUIPMENT ROOM	DRYWALL	W/C		1-10M	
27	ANN	1.0	VOR	EQUIPMENT ROOM	DRYWALL (NEW)	W		1-3M	
28	ANN	1.0	VOR	EQUIPMENT ROOM	DRYWALL JOINT COMPOUND	W/C		1-11M	1-10M
29	ANN	1.0	VOR	EQUIPMENT ROOM	DRYWALL JOINT COMPOUND (NEW)	W		1-8M	1-9M
30	ANN	1.0	VOR	EQUIPMENT ROOM	BASEBOARD MASTIC (BRN)	W	1- 6M	1-6M	1-7M
31	ANN	1.0	VOR	EQUIPMENT ROOM	BASEBOARD MASTIC (BRN)	W	1- 7M	1-6M	1-7M
32	ANN	1.0	VOR	EQUIPMENT ROOM	1 FT X 1 FT BRN FLOOR TILE	F	1-12M	1-12M	1-13M

For Sample Location: F = Floor C = Ceiling W = Wall R = Roof M = Miscellaneous Sample Numbers: P = Previous Inspection
Floor Numbers: 0.0 = Base Building 0.4 = Mechanical Level 0.5 = Tower Basement Level 0.9 = Building Exterior 90.0+ = Detached Buildings and Trailers 99.0 = Facility

Record Number	Percent Asbestos	Asbestos Type	Friable	Potential for Distrubance	Disturbance Source	Condition	Hazard Ranking	Recommended Action	Approx Quantity of Material in Room	Cost Estimate	Comments
9										0.00	
11										0.00	
12										0.00	
13										0.00	
14	4.0	CHRY	N	LP	C	G	1	1	284 SQ FT	0.00	
15										0.00	
10										0.00	
16	4.0	CHRY	N	LP	C	G	1	1	SEE COMMENTS	0.00	WHERE PRESENT ON ORIGINAL WALLS AND CEILING
17										0.00	REFLECTED BY ACTUAL SAMPLE 1-10M
18										0.00	
19										0.00	
20										0.00	
21	4.0	CHRY	N	LP	C	G	1	1	SEE COMMENTS	0.00	WHERE PRESENT ON ORIGINAL WALLS AND CEILING
22			N	LP	C/V	G	1	1		0.00	NOT SAMPLED TO AVOID DAMAGE; ASSUME ACM
23										0.00	
24	4.0	CHRY	N	LP	C	G	1	1	646 SQ FT	0.00	
25										0.00	
26										0.00	
27										0.00	
28	4.0	CHRY	N	LP	C	G	1	1	SEE COMMENTS	0.00	WHERE PRESENT ON ORIGINAL WALLS AND CEILING
29										0.00	
30										0.00	
31										0.00	
32	7.0	CHRY	N	LP	C	G	1	1	10 SQ FT	0.00	WITHIN EQUIPMENT RACK

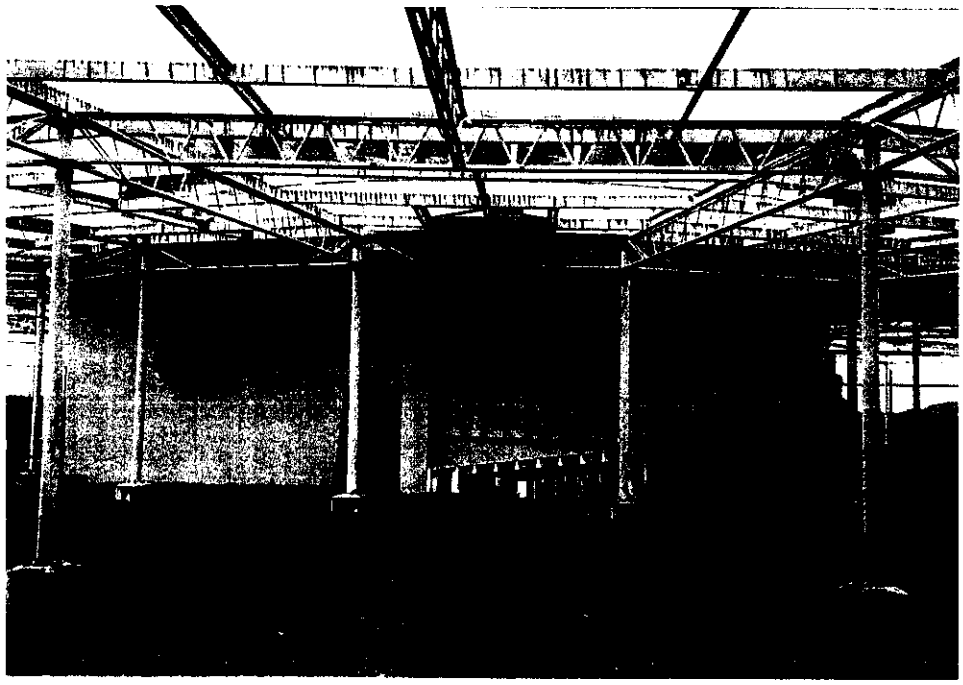
For Percent Asbestos: TR = Trace

Record Number	Loc ID	Floor Number	Building	Room Description	Material Description	Sample Location	Actual Sample	Reference Sample	Related Samples
33	ANN	1.0	VOR	EQUIPMENT ROOM	1 FT X 1 FT BRN FLOOR TILE MASTIC	F	1-12M	1-12M	1-13M
34	ANN	1.0	VOR	EQUIPMENT ROOM	1 FT X 1 FT BRN FLOOR TILE	F	1-13M		SEE COMMENTS
35	ANN	1.0	VOR	EQUIPMENT ROOM	1 FT X 1 FT BRN FLOOR TILE MASTIC	F	1-13M	1-12M	1-13M
36	ANN	1.0	VOR	EXTERIOR/ROOF	ROOFING MATERIALS	R			SEE COMMENTS
37	ANN	1.0	VOR	STORAGE ROOM	BASEBOARD MASTIC (BRN)	W		1-6M	1-7M
38	ANN	1.0	VOR	STORAGE ROOM	DRYWALL	W		1-10M	
39	ANN	1.0	VOR	STORAGE ROOM	DRYWALL JOINT COMPOUND	W		1-11M	1-10M
40	ANN	1.0	VOR	STORAGE ROOM	1 FT X 1 FT TAN FLOOR TILE	F	1- 1M	1-1M	1-1MQA/4M
41	ANN	1.0	VOR	STORAGE ROOM	1 FT X 1 FT TAN FLOOR TILE MASTIC	F	1- 1M	1-1MQA	1-1M/4M
42	ANN	1.0	VOR	STORAGE ROOM	1 FT X 1 FT TAN FLOOR TILE	F	1- 1MQA	1-1M	1-1MQA/4M
43	ANN	1.0	VOR	STORAGE ROOM	1 FT X 1 FT TAN FLOOR TILE MASTIC	F	1- 1MQA	1-1MQA	SEE COMMENTS
44	ANN	1.0	VOR	STORAGE ROOM	BASEBOARD MASTIC (WHT)	W	1- 2M	1-2M	1-5M
45	ANN	1.0	VOR	STORAGE ROOM	DRYWALL (NEW)	W/C	1- 3M	1-3M	
46	ANN	1.0	VOR	STORAGE ROOM	DRYWALL JOINT COMPOUND (NEW)	W/C	1- 8M	1-8M	1-9M
47	ANN	1.0	VOR	STORAGE ROOM	DRYWALL JOINT COMPOUND (NEW)	W/C	1- 9M	1-8M	1-9M
48	ANN	99.0	VOR	FACILITY	FIRE DOOR	M			SEE COMMENTS

Record Number	Percent Asbestos	Asbestos Type	Friable	Potential for Distrubance	Disturbance Source	Condition	Hazard Ranking	Recommended Action	Approx Quantity of Material in Room	Cost Estimate	Comments
33										0.00	
34										0.00	REFLECTED BY ACTUAL SAMPLE 1-12M
35										0.00	
36			N	LP	C	G	1	1	2,056 SQ FT	0.00	INACCESSIBLE; ASSUME ACM
37										0.00	
38										0.00	
39	4.0	CHRY	N	LP	C	G	1	1	SEE COMMENTS	0.00	WHERE PRESENT ON ORIGINAL WALLS
40										0.00	
41	4.0	CHRY	N	LP	C	G	1	1	36 SQ FT	0.00	
42										0.00	
43										0.00	REFLECTED BY ACTUAL SAMPLE 1-1M
44										0.00	
45										0.00	
46										0.00	
47										0.00	
48			N	LP	C	G	1	1		0.00	NOT SAMPLED TO AVOID DAMAGE; ASSUME ACM

For Percent Asbestos: TR = Trace

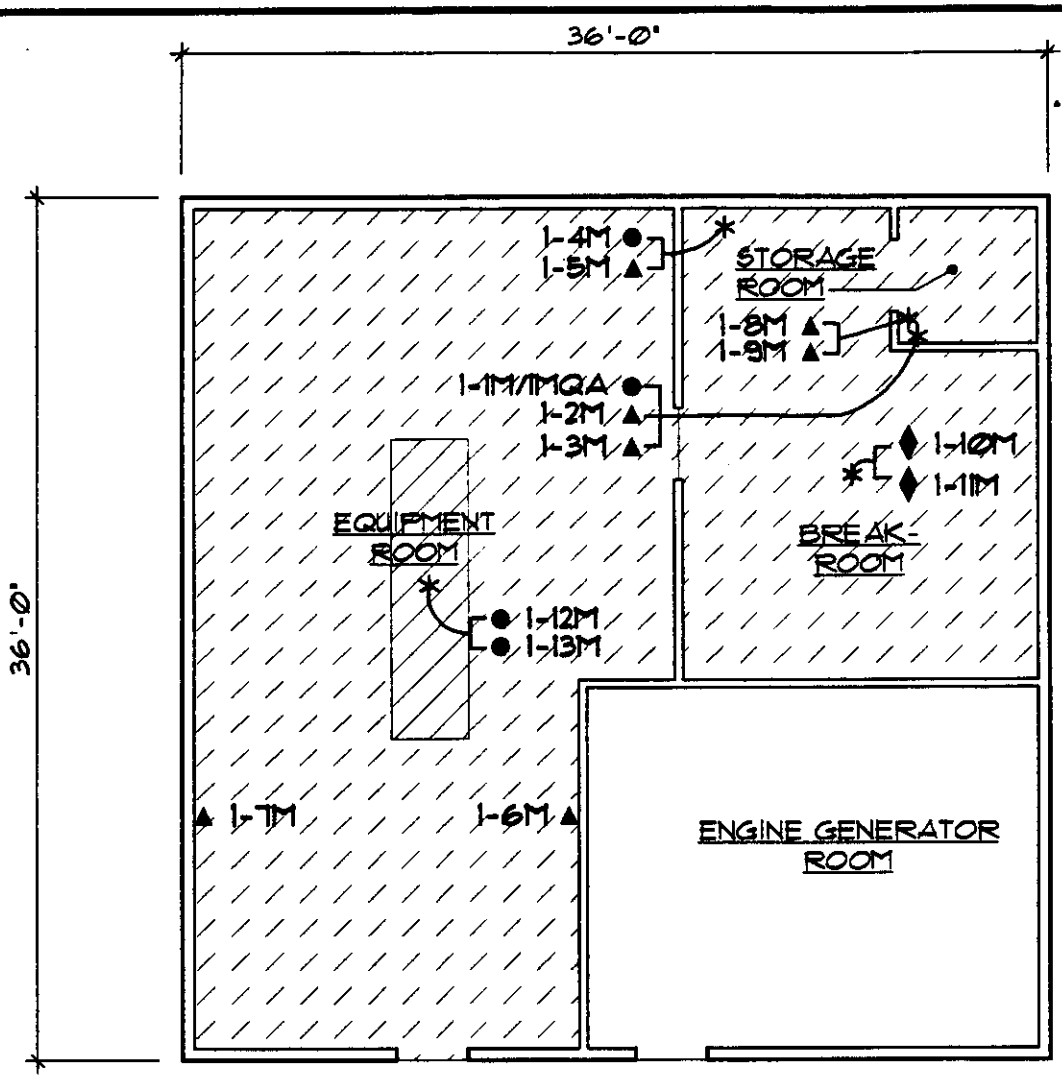
PHOTOS



1) View of the Annette Island VOR Building (412). August 1994

EXHIBITS

A362-033/ANN-VOR 12/12/94



FLOOR PLAN
1/8"=1'-0"

N

INDICATES AREAS WITH ACM FLOOR TILE MASTIC ONLY

INDICATES AREAS WITH ACM FLOOR TILE ONLY

NOTES:
ALL FIRE DOORS THROUGHOUT THIS FACILITY WERE NOT SAMPLED TO AVOID DAMAGE; ASSUME ACM.

- BREAKROOM
  - ACM DRYWALL JOINT COMPOUND WHERE PRESENT ON ORIGINAL WALLS AND CEILING.
- ENGINE GENERATOR ROOM
  - ACM DRYWALL JOINT COMPOUND WHERE PRESENT ON ORIGINAL WALLS AND CEILING.
  - GASKETS ON ENGINE GENERATOR; NOT SAMPLED TO AVOID DAMAGE; ASSUME ACM.
- EQUIPMENT ROOM
  - ACM DRYWALL JOINT COMPOUND WHERE PRESENT ON ORIGINAL WALLS AND CEILING.
- STORAGE ROOM
  - ACM DRYWALL JOINT COMPOUND WHERE PRESENT ON ORIGINAL WALLS.
- ROOF
  - 2,056 SQ. FT. ROOFING MATERIALS; INACCESSIBLE, ASSUME ACM.

SAMPLE ID REFERENCE #
ANN (LOC. ID) – VOR (BLD'G. ID)

SCHEDULE OF SAMPLES
- ● = FLOOR
- ▲ = WALL
- ♦ = CEILING
- ■ = ROOF
- ○ = MISCELLANEOUS
- * = MULTIPLE SAMPLE LOCATION

VHF OMNIDIRECTIONAL RANGE BUILDING #412
ASBESTOS SURVEY
ANNETTE ISLAND STATION, ALASKA

Date: 12/12/94
Drawn By: WHT
Check. By:

Exhibit 3 of 3

RMCI RESEARCH MANAGEMENT CONSULTANTS, INC.
California Colorado Virginia Georgia
3190 South Wadsworth Blvd – Suite 100
Lakewood, Colorado 80227
(303) 969-8778 FAX (303) 969-8929

A362-033

LABORATORY RESULTS

NVLAP LAB NO. 1896

ASBESTOS - TEM, PCM, PLM, SEM
METALS - AA, FLAME/FURNACE
AIRBORNE PARTICULATES
SPECIAL PARTICLE ANALYSIS

AIHA LAB I.D. 10768

RESERVOIRS ENVIRONMENTAL
SERVICES, INC.

1827 GRANT STREET DENVER, COLORADO 80203 (800) 678-7374 (303) 830-1986 FAX (303) 863-9196

August 11, 1994

Ms. Esther Skov
RMCI
3190 Wadsworth Boulevard, Suite 100
Lakewood, CO 80227

RE: Job No. RES 21395A - A160-2-053/055/057, V3-94-11969 ANN - Bulk Samples: ANN-VOR-1-1M, ANN-VOR-1-2M, ANN-VOR-1-3M, ANN-VOR-1-4M, ANN-VOR-1-5M, ANN-VOR-1-6M, ANN-VOR-1-7M, ANN-VOR-1-8M, ANN-VOR-1-9M, ANN-VOR-1-10M, ANN-VOR-1-11M, ANN-VOR-1-12M and ANN-VOR-1-13M.

Dear Ms. Skov:

Reservoirs Environmental Services, Inc. (RES, Inc.) has analyzed 13 bulk material samples by Polarized Light Microscopy (PLM) for asbestos content as per your request. The samples were received on August 5, 1994, and initial results were telephoned to your office on August 10, 1994. PLM was used to analyze the bulk materials in compliance with guidelines established by the USEPA (40 CFR Part 763, Subpart F, Appendix A). The Analytical Results are presented in Table I.

RES, Inc. has assigned job number RES 21395A to this study. This report is considered highly confidential and the sole property of RMCI. RES, Inc. will not discuss any part of this study with personnel other than those of the client company. Samples will be disposed of after sixty days unless longer storage is requested. The US EPA guideline (40 CFR Part 763, Subpart F, Appendix A) was developed for use on friable building materials and is not recommended for non-friable materials such as floor tiles. RES, Inc. recommends additional analyses to confirm negative PLM results on floor tiles.

If you should have any questions about this report, please feel free to call me at 830-1986.

Sincerely,

Jeanne Spencer Orr
Vice President

RKD/cma

Analyst(s):
Cheryl A. Dempsey
Greg Behnfeldt
Patrick Coughlan
Paul D. Lo Scalzo
Robert L. Gault

RESERVOIRS ENVIRONMENTAL SERVICES, INC.

NVLAP Accredited Laboratory #1896

TABLE I. PLM BULK ANALYSIS, PERCENTAGE COMPOSITION BY VOLUME

RES Job Number: **RES 21395A**
Client: **RMCI**
Client Project: **A160-2-053/055/057, V3-94-11969 ANN**
Date Samples Received: **August 5, 1994**
Analysis Type: **PLM Short Report**
Turnaround: **3-5 Day**

Client Sample Number	Lab ID Number	TOTAL ASBESTOS (%)	Layer	Physical Description	Portion of Total Sample (%)	ASBESTOS CONTENT BY LAYER Mineral	Visual Estimate (%)	Non-Asbestos Fibrous Components (%) CELL	GLASS	SYNTH	HAIR	WOLL	TALC	OTHER	Non-Fibrous Components (%)
ANN-VOR-1-1M	EM 133583	**ND**	A	Clear resin	1		ND	TR	0	0	0	0	0	0	100
1x1 Tan Floor Tile/Mastic			B	White & tan tile	99		ND	0	0	0	0	0	0	0	100
ANN-VOR-1-2M	EM 133584	**ND**	A	White fibrous material	3		ND	97	0	0	0	0	0	0	3
Baseboard Mastic (Wht)			B	White paint	12		ND	0	0	0	0	0	0	0	100
			C	Gray resinous material	15		ND	0	0	0	0	0	0	0	100
			D	Tan resinous material	70		ND	TR	0	0	0	0	0	0	100
ANN-VOR-1-3M	EM 133585	**ND**	A	Tan paint	2		ND	0	0	0	0	0	0	0	100
Drywall (New)			B	White plaster	3		ND	0	0	0	0	0	0	0	100
			C	Tan fibrous material	10		ND	97	0	0	0	0	0	0	3
			D	White fibrous plaster	85		ND	10	TR	0	0	0	0	0	90
ANN-VOR-1-4M	EM 133586	**ND**	A	Black tar	1		ND	TR	0	0	0	0	0	0	100
1x1 Tan Floor Tile/Mastic			B	White & tan tile	99		ND	0	0	0	0	0	0	0	100
ANN-VOR-1-5M	EM 133587	**ND**	A	White paint	10		ND	0	0	0	0	0	0	0	100
Baseboard Mastic (Wht)			B	White fibrous material	15		ND	97	0	0	0	0	0	0	3
			C	Tan & gray resinous material	75		ND	TR	0	0	0	0	0	0	100
ANN-VOR-1-6M	EM 133588	**ND**	A	White paint	10		ND	0	0	0	0	0	0	0	100
Baseboard Mastic (Brn)			B	Tan fibrous material	15		ND	97	0	0	0	0	0	0	3
			C	Brown resinous material	20		ND	TR	0	0	0	0	0	0	100
			D	Tan & gray resinous material	55		ND	TR	0	0	0	0	0	0	100

ND = None Detected CELL = Cellulose ORG = Organic WOLL = Wollastonite GYP = Gypsum Analyst: BG
TR = Trace Mat = Material BRUC = Brucite Trem-Act = Tremolite-Actinolite SYNTH = Synthetic

Data QA

RESERVOIRS ENVIRONMENTAL SERVICES, INC.

NVLAP Accredited Laboratory #1896

TABLE I. PLM BULK ANALYSIS, PERCENTAGE COMPOSITION BY VOLUME

RES Job Number: **RES 21395A**
Client: **RMCI**
Client Project: **A160-2-053/055/057, V3-94-11969 ANN**
Date Samples Received: **August 5, 1994**
Analysis Type: **PLM Short Report**
Turnaround: **3-5 Day**

Client Sample Number	Lab ID Number	TOTAL ASBESTOS (%)	Layer	Physical Description	Portion of Total Sample (%)	ASBESTOS CONTENT BY LAYER Mineral	Visual Estimate (%)	Non-Asbestos Fibrous Components (%) CELL	GLASS	SYNTH	HAIR	WOLL	TALC	OTHER	Non-Fibrous Components (%)
ANN-VOR-1-7M	EM 133589	**ND**	A	Tan paint	5		ND	0	0	0	0	0	0	0	100
Baseboard Mastic (Brn)			B	Brown resin	45		ND	TR	0	0	0	0	0	0	100
			C	Tan resinous material	50		ND	TR	0	0	0	0	0	0	100
ANN-VOR-1-8M	EM 133590	**ND**	A	White paint	15		ND	0	0	0	0	0	0	0	100
Drywall Joint Compound (New)			B	White plaster	85		ND	0	0	0	0	0	0	0	100
ANN-VOR-1-9M	EM 133591	**ND**	A	White paint	10		ND	0	0	0	0	0	0	0	100
Drywall Joint Compound (New)			B	White plaster	90		ND	0	0	0	0	0	0	0	100
ANN-VOR-1-10M	EM 133592	**1.5**	A	White paint	5		ND	0	0	0	0	0	0	0	100
Drywall Joint Compound			B	Tan fibrous material	45		ND	97	0	0	0	0	0	0	3
			C	Tan plaster	50	**Chrysotile**	3	TR	0	0	0	0	0	0	97
ANN-VOR-1-11M	EM 133593	**2.0**	A	White paint	10		ND	97	0	0	0	0	0	0	3
Drywall Joint Compound			B	Multicolored paint	40		ND	0	0	0	0	0	0	0	100
			C	Tan plaster	50	**Chrysotile**	4	TR	0	0	0	0	0	0	96
ANN-VOR-1-12M	EM 133594	**6.7**	A	White & green tile	5	**Chrysotile**	15	0	0	0	0	0	0	0	85
1x1 Brn Floor Tile/Mastic			B	Tan resin	10	**Chrysotile**	TR	TR	0	0	0	0	0	0	100
			C	Tan & brown tile	85	**Chrysotile**	7	0	0	0	0	0	0	0	93

ND = None Detected CELL = Cellulose ORG = Organic WOLL = Wollastonite GYP = Gypsum
TR = Trace Mat = Material BRUC = Brucite Trem-Act = Tremolite-Actinolite SYNTH = Synthetic

Data QA

RESERVOIRS ENVIRONMENTAL SERVICES, INC.

NVLAP Accredited Laboratory #1896

TABLE I. PLM BULK ANALYSIS, PERCENTAGE COMPOSITION BY VOLUME

RES Job Number: **RES 21395A**
Client: **RMCI**
Client Project: **A160-2-053/055/057, V3-94-11969 ANN**
Date Samples Received: **August 5, 1994**
Analysis Type: **PLM Short Report**
Turnaround: **3-5 Day**

Client Sample Number	Lab ID Number	TOTAL ASBESTOS (%)	Layer	Physical Description	Portion of Total Sample (%)	ASBESTOS CONTENT BY LAYER Mineral	Visual Estimate (%)	Non-Asbestos Fibrous Components (%) CELL	GLASS	SYNTH	HAIR	WOLL	TALC	OTHER	Non-Fibrous Components (%)
ANN-VOR-1-13M	EM 133595	**6.7**	A	White & green tile	5	**Chrysotile**	15	0	0	0	0	0	0	0	85
1x1 Brn Floor Tile/Mastic			B	Tan resin	10		ND	TR	0	0	0	0	0	0	100
			C	Tan & brown tile	85	**Chrysotile**	7	0	0	0	0	0	0	0	93

ND = None Detected
TR = Trace
CELL = Cellulose
Mat = Material
ORG = Organic
BRUC = Brucite
WOLL = Wollastonite
Trem-Act = Tremolite-Actinolite
GYP = Gypsum
SYNTH = Synthetic

Data QA

NVLAP LAB NO. 1896

ASBESTOS - TEM, PCM, PLM, SEM
METALS - AA, FLAME/FURNACE
AIRBORNE PARTICULATES
SPECIAL PARTICLE ANALYSIS

AIHA LAB I.D. 10768

RESERVOIRS ENVIRONMENTAL
SERVICES, INC.

1827 GRANT STREET DENVER, COLORADO 80203 (800) 678-7374 (303) 830-1986 FAX (303) 863-9196

October 17, 1994

Ms. Esther Skov
RMCI
3190 Wadsworth Boulevard, Suite 100
Lakewood, CO 80227

RE: Job No. RES 21395PC - A160-2-053/055/057, V3-94-11969, ANN - Bulk Samples: ANN-VOR-1-12M.

Dear Ms. Skov:

Reservoirs Environmental Services, Inc. (RESI) has point counted one bulk material sample by Polarized Light Microscopy (PLM) for asbestos content as per your request. The sample was received on August 5, 1994. You requested point counting on October 12, 1994, and results were telephoned to your office on October 17, 1994. PLM was used to analyze the bulk material in compliance with guidelines established by the USEPA (40 CFR Part 763, Subpart F, Appendix A). The Analytical Results are presented in Table I.

RES, Inc. has assigned job number RES 21395PC to this study. This report is considered highly confidential and the sole property of RMCI. RES, Inc. will not discuss any part of this study with personnel other than those of the client company. Samples will be disposed of after sixty days unless longer storage is requested. The US EPA guideline (40 CFR Part 763, Subpart F, Appendix A) was developed for use on friable building materials and is not recommended for non-friable materials such as floor tiles. RES, Inc. recommends additional analyses to confirm negative PLM results on floor tiles.

If you should have any questions about this report, please feel free to call me at 830-1986.

Sincerely,

Robert K. Dickson
Assistant Division Manager

RKD/cma

Analyst(s):
Cheryl A. Dempsey
Greg Behnfeldt
Paul D. Lo Scalzo
Robert L. Gault

RESERVOIRS ENVIRONMENTAL SERVICES, INC.

NVLAP Accredited Lab 1896

TABLE I. PLM BULK ANALYSIS, PERCENTAGE COMPOSITION BY POINT COUNT

RES Job Number:	RES 21395 PC
Client:	RMCI
Client Project:	A160-2-053/055/057, V3-94-11969, ANN
Date Samples Received:	August 5, 1994
Analysis Type:	PLM, Point Count
Turnaround:	3-5 Day

Client Sample Number	Lab ID Number	LAYER ANALYZED	ASBESTOS MINERAL	ASBESTOS CONTENT Point Count (%)
ANN-VOR-1-12M	EM 133594	B, mastic		ND

ND = None Detected Analyst: PDL

Trace = Asbestos observed but not counted under point count protocol

DCM SCIENCE LABORATORY, INC.
BULK ASBESTOS ANALYSIS

REPORTING DATE: AUGUST 12, 1994
CLIENT: RESEARCH MANAGEMENT CONSULTANTS, INC.
CLIENT JOB NO.: A160-2-055,051,047,057 KTN,LVD,PSG,ANN
CONTACT: ESTHER SKOV
PROJECT NUMBER: RMCI5560

DCMSL SAMPLE NUMBER	CLIENT SAMPLE NUMBER	SAMPLE DATE	CLIENT SAMPLE DESCRIPTION/ LOCATION	DCMSL DESCRIPTION	PERCENT OF SAMPLE	ASBESTIFORM MINERAL FIBERS RANGE	%	TYPE	TOTAL ASBESTOS	OTHER FIBROUS CONSTITUENTS GLASS	CELLULOSE	OTHER	NON-FIBROUS CONSTITUENTS	TOTAL PERCENTAGE IDENTIFIED MATERIALS
-1	ANN-VOR-1-1MQA	8-3-94	1ST FLOOR STORAGE ROOM 1X1 TAN FLOOR TILE/ MASTIC	A. YELLOW RESINOUS/BLACK TAR (INSEPARABLE)	2.0%	[1-5]	4.0	CHRYSOTILE	4.0	0.0	0.0	0.0	96.0	100.0
				B. WHITE TILE	98.0%		0.0		0.0	0.0	0.0	0.0	100.0	100.0
				TOTAL SAMPLE					0.1	0.0	0.0	0.0	99.9	100.0

FOR CALCULATION PURPOSES, TRACE (TR) IS ASSUMED TO BE 0.5%.

DCM SCIENCE LABORATORY, INC.
12477 W. CEDAR DRIVE
LAKEWOOD, CO 80228

DCM PROJECT NO.: RMCI5560

CLIENT JOB NO.: A-160-2-055

BULK SAMPLE ANALYSIS

BULK SAMPLE ANALYSIS PROCEDURES:

DCM Science Laboratory, Inc. analyzes bulk asbestos samples following procedures developed by the McCrone Research Institute and in compliance with guidelines established by the Environmental Protection Agency (EPA-600/M4-82-020, December, 1982).

Bulk samples are prepared for analysis using a 10X-80X stereo microscope in a hepa filter hood which provides a contamination-free environment. The sample is then analyzed by polarized light microscopy (PLM) at 100X. When a sample consists of more than one layer, each layer is prepared and analyzed separately. Fiber and matrix materials are identified by the characterization of optical properties including color and pleochroism, form, cleavage, relief, birefringence, extinction, orientation, twinning, interference figure and other distinguishing features. Dispersion staining is also used to further aid in mineral identification. All percentages of asbestos, other fibers and non-fibrous constituents are calculated from the values obtained from the stereo and PLM microscopes analysis. In-house and NIST standards as well as a chart prepared by R.D. Terry and G.V. Chilinger for "The Journal of Sedimentary Petrology", (Volume 24, pp. 229-234, 1955) provide a guide for estimating percentages. All samples are archived for six months unless other arrangements are made by the client.

ACCREDITATION:

DCMSL is accredited by the AIHA (since 1986). Our accreditation number is 305. DCMSL was accredited by NVLAP (since April 1, 1989). Our NVLAP Lab Code is 1258.

ENDORSEMENT:

The results of this analysis must not be used by the client to claim endorsement by NVLAP or any agency of the U.S. Government.

This test report relates only to the items tested. The analysis was performed by:

M. J. Martin
ANALYST
MICHAEL J. MARTIN

Paul F. Knappe
ANALYST
PAUL F. KNAPPE

ANALYST

8-12-94
ANALYSIS DATE

LABORATORY DIRECTOR

Rev. 7/92

2.7 GENERAL RECOMMENDATIONS

RMCI recommends the development and implementation of an Operations and Maintenance Program in accordance with the FAA's standard guidelines, and specific to the Annette Island Station.

The principal objective of an O&M Program is to minimize exposure of all building occupants to asbestos fibers. To accomplish this objective, an O&M Program includes work practices designed to assist in (1) maintaining ACM in good condition, (2) ensuring proper cleanup of asbestos fibers previously released, (3) preventing further release of asbestos fibers, and (4) monitoring the condition of ACM.

The specified O&M work practices and procedures should be employed by trained personnel during building, cleaning, maintenance, renovation, and general operational activities that may involve surfacing, thermal, or miscellaneous ACM. To achieve its objectives, a successful O&M Program should include the following elements:

- **Notification:** Develop a program to tell workers, visitors, and building occupants where ACM is located, and how and why to avoid disturbing the ACM. All persons affected should be properly informed and all friable ACM should be properly labeled.

- **Surveillance:** Conduct regular ACM surveillance and re-inspection to note, assess, and document any condition changes in the ACM.

- **Controls:** Implement a work control/permit system to control activities which might disturb ACM.

- **Work Practices:** Establish O&M work practices to avoid or minimize fiber release during activities affecting ACM.

- **Record Keeping:** Document O&M activities.

- **Worker Protection:** Develop medical and respiratory protection programs, as applicable.

- **Training:** Establish a Facility Asbestos Coordinator, and provide custodial and maintenance staff training.

- **Emergency Procedures:** Implement proper emergency response procedures.

- **Air Monitoring:** Track and monitor health concerns and action levels.

2.8 LIMITATIONS

This report describes the locations and conditions of ACM identified at the Annette Island Station at the time of inspection. RMCI represents that our services are performed within the limits prescribed by applicable regulations and in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is made to the client, expressed or implied, and no warranty or guarantee is included or intended.

APPENDIX A

USES AND CLASSIFICATIONS OF ASBESTOS PRODUCTS

INTRODUCTION

Asbestos minerals are hydrated magnesium silicates which display a crystalline structure and occur naturally as parallel bundles of minute fibers. The physical disturbance of these bundles generally results in separation into smaller bundles of individual fibers.

Asbestos minerals are divided into two groups - serpentine and amphiboles. Serpentine minerals display a sheet or layered crystalline structure, while amphiboles demonstrate a chain-like crystalline structure. Chrysotile, a serpentine, is the most commonly used type of asbestos and accounts for approximately ninety-five percent of the asbestos found in buildings in the United States. In the amphibole group, amosite is the most likely asbestos type to be found in buildings, followed by crocidolite. Anthophyllite, tremolite, and actinolite are also in the amphibole group, but are of little commercial value.

ASBESTOS PRODUCTS

Asbestos has been used in more than 3,000 commercial products because of its high strength and flexibility, its noncombustible properties and chemical stability, and its poor conduction of heat and electricity. Building materials which contain asbestos are referred to as Asbestos-Containing Materials, or ACM. Based on fiber release potential, ACM is classified as either: 1) friable; or 2) non-friable. Friable is defined as the ability to crush or reduce to powder by hand pressure. Under normal operating or use conditions, friable material is thought to release asbestos fibers more readily and under less disturbance than non-friable materials, thus increasing the chance for exposure. Below is a brief discussion of product types which use asbestos.

- **Friction Products**

  Asbestos is used in brake linings for automobiles, buses, trucks, railcars, industrial machinery, and in vehicle or industrial clutch linings. Friction materials are generally considered non-friable, but asbestos dust may be released during fabrication, installation, and product use.

- **Plastic Products**

  Plastic products include vinyl-asbestos tile (VAT), asphalt floor coverings, asphalt roof coatings, and traditional molded plastic products. The asbestos in these products is usually tightly bound. However, any sawing, drilling, or sanding will result in the release of asbestos dust.

- **Cement Pipe and Sheet**

  Asbestos-cement (A-C) pipe has been widely used for water and sewer mains, and is occasionally used for electrical conduit, drainage pipes, and vent pipes. Asbestos-cement sheets (cementitious panels), manufactured in flat or corrugated panels and shingles, have been used primarily for roofing and siding.

The normal use of A-C pipe for water or sewer mains has been known to release asbestos fibers into the fluid carried through them. The asbestos in A-C pipe and sheets is tightly bound and is not released into the air under normal use. However, any sawing, drilling, or sanding of these materials during installation, renovation, or removal will result in fiber releases. In addition, normal breakage and crushing involved in the demolition of structures can result in asbestos fiber releases. For this reason, these materials are subject to NESHAP regulations during demolition operations.

- **Paper Products**

Roofing felts, gaskets, pipeline wrap, insulating paper, aircell, and other paper products were manufactured using asbestos fibers instead of cellulose. The asbestos fibers in most paper products are sufficiently bound to prevent their release during normal product use; however, some are considered friable. In addition, cutting or tearing the material during installation, use, or removal may result in a release of asbestos dust.

- **Textile Products**

Asbestos yarn, cloth, rope, and other textiles are used to manufacture fire-resistant curtains or blankets, protective clothing, gaskets, vibration collars, electrical insulation, thermal insulation, and packing seals. These raw textile products have a high asbestos content (eighty-five percent). However, they are typically coated or impregnated with polymers before assembly into final products. These products may release asbestos fibers if cut or torn, or, for some products, during normal use.

- **Thermal Insulation and Decorative Products**

These types of products were commonly applied to steel I-beams and decks, concrete ceilings, and walls. Most of these materials are considered friable and may contain fifty to ninety percent asbestos. Most sprayed-on materials were banned for fireproofing or insulation in 1973, and for decorative purposes in 1978.

Asbestos insulation board was used as a thermal or fireproofing barrier in many types of walls and ceilings, as well as ducts and pipe enclosures. High asbestos dust levels have been measured during many board handling operations, including simple unloading of uncut sheets.

- **Thermal System Insulation**

Asbestos-containing thermal system insulation (TSI) generally refers to sprayed, troweled, molded (prefabricated), and/or wet-applied asbestos insulation used to cover boilers, piping, and tank heating systems. These materials generally have an asbestos content ranging from fifty to ninety percent by volume, and were placed on systems to increase energy efficiency and prevent condensation. TSI coverings are considered friable.

Heating, ventilation, and air conditioning (HVAC) systems, including pipe and boiler equipment, were also covered with ACM to increase their efficiency and reduce energy requirements. HVAC ducting may also be covered with aircell-like materials, batting, felts, transite-like sheeting, paints, mastics, and wrap.

- **Other Asbestos Uses**

  Other uses of asbestos have included exterior siding shingles, shotgun shell base wads, asphalt paving mix, spackle and joint compounds, artificial logs for gas fireplaces, artificial snow, and various thermal paints. Use of asbestos as an ingredient in spackle and joint compounds was banned in 1978.

ASBESTOS HEALTH EFFECTS AND ROUTES OF ENTRY

Asbestos exposure may be occupational, para-occupational, or environmental in origin. Although asbestos exposure may have occurred during childhood, the manifestation of asbestos-related diseases may not occur for many years. Furthermore, asbestos may enhance the carcinogenic effects of other materials. Most of the conclusive evidence regarding asbestos exposure health effects is derived from studies of occupational exposure of asbestos-application workers. These workers experienced asbestos fiber concentrations many times higher than those encountered by the general public or by most office workers in buildings containing ACM. Individuals who work in facilities which contain friable ACM may experience higher than normal risks when compared to the general public. The available data, however, are not conclusive and do not allow precise estimates of actual risk.

The primary route of exposure leading to the development of a disease caused by asbestos is inhalation of airborne fibers. Although digestion and dermal penetration have been demonstrated as possible exposure routes in clinical and laboratory studies, they generally are not viewed as occupational exposure routes in most settings. In most cases where negative health effects occurred due to asbestos exposure, the diseases manifested themselves in the respiratory system.

- **The Human Respiratory System**

  The respiratory tract is the channel by which air flows into and out of the lungs. The respiratory system is sensitive to bacteria, viruses, and airborne particles that can be inhaled. Reaction to these irritants can disrupt the functioning of the system, resulting in ailments such as the common cold, hay fever, sinusitis, sore throat, acute or chronic bronchitis, emphysema, and lung cancer.

  When air-suspended asbestos particles enter the airway and reach air sacs in the lungs, white blood cells may attempt to engulf and digest the particles. As a secondary defense, the white blood cells may also deposit a calcium-like coating on the fiber. These coated fibers clog and scar the lung tissue, and accumulate if exposure continues. As a result, the lungs may lose their ability to supply oxygen to the blood stream. If the white blood cells do not engulf the fibers and the body does not eliminate the foreign material, the fiber may migrate through the lung tissue to the mesothelium or enter the bloodstream. This may result in the development of a carcinoma in other organs or tissues of the body.

- **Epidemiology**

  More than thirty major epidemiological studies have been conducted to determine the health effects of occupational asbestos exposure. These data suggest that asbestos is a human carcinogen which causes lung cancer, mesothelioma, and some other cancers, as well as asbestosis. Epidemiological data suggest a synergistic relationship between asbestos and smoking.

- **Diseases Associated With Asbestos Exposures**

The link between asbestos and the lung disease "asbestosis" dates to 1900. Autopsy reports from 1928 to 1949 indicated that a large number of persons who died with asbestosis also had lung cancer. In the 1960s, the link between asbestos and a rare form of cancer called "mesothelioma" was established. Diseases attributed to asbestos exposures are asbestosis, mesothelioma, and lung cancer. Other diseases noted in workers exposed to asbestos include cancer of the larynx, esophagus, stomach, colon-rectum, kidney, and pancreas. However, this correlation is not conclusive.

APPENDIX B

ACRONYM LIST AND

GLOSSARY

ACRONYM LIST

- **ACM/ACBM** - asbestos-containing material / asbestos-containing building material
- **ADM** - Assistant Division Manager
- **AHERA** - Asbestos Hazard Emergency Response Act
- **AHU** - air handling unit
- **AIHA** - American Industrial Hygiene Association
- **AL** - Action Level
- **AMTS** - Assistant Manager Technical Support
- **ARSR** - Air Route Surveillance Radar
- **ASM** - Assistant Sector Manager
- **ASR** - Airport Surveillance Radar
- **BAS** - below analytical sensitivity (TEM)
- **BDL** - below detection limit (PCM)
- **CFR** - Code of Federal Registry
- **DOT** - Department of Transportation
- **DYSIM** - Dynamic Simulator
- **EL** - Excursion Limit
- **EPA** - Environmental Protection Agency
- **ESU** - Environmental Support Unit
- **f/cc** - fibers per cubic centimeter
- **FAA** - Federal Aviation Administration
- **FDP** - Flight Data Processing
- **FSS** - Flight Service Station
- **GNAS** - General NAS Sector
- **HEPA** - high efficiency particulate air
- **HMMP** - Hazardous Material Management Plan
- **HOST** - Host Computer System

- **HVAC** - heating, ventilation and air-conditioning
- **IFD** - Inter Facility Data
- **ISSS** - Initial Sector Suite Subsystem
- **LORAN** - Long-Range Navigation
- **Micro-vac** - micro-vacuum
- **MME** - Manager Maintenance Engineering
- **MMO** - Manager Maintenance Operations
- **MMS** - Manager Maintenance Systems
- **MSHA** - Mining Safety and Health Administration
- **NAS** - National Airspace System
- **NAVAIDS** - Navigational Aids
- **NESHAP** - National Emission Standards for Hazardous Air Pollutants
- **NIOSH** - National Institute for Occupational Safety and Health
- **NIST** - National Institute for Standards and Technology
- **NVLAP** - National Voluntary Laboratory Accreditation Program
- **O&M** - Operations and Maintenance
- **ORM** - OSHA Reference Method
- **OSHA** - Occupational Safety and Health Administration
- **PAPR** - powered air purifying respirator
- **PCM** - phase contrast microscopy
- **PEL** - Permissable Exposure Limit
- **PLM** - polarized light microscopy
- **PPE** - personal protective equipment
- **PVD** - Plan View Display
- **QA/QC** - quality assurance / quality control
- **RCAG** - Remote Communications Air-to-Ground
- **RDP** - Radar Data Processing
- **s/mm'** - structures per square millimeter

- **SBA** - Small Business Administration
- **SEM** - scanning electron microscopy
- **SMMC** - Systems Maintenance Monitoring Console
- **TELCO** - Telephone Company Local
- **TEM** - transmission electron microscopy
- **TMU** - Traffic Management Unit (Flow Control)
- **TRACON** - Terminal Radar Approach Control
- **TSI** - thermal system insulation
- **UPS** - Uninterrupted Power Service
- **VAE** - visual area estimation
- **VAT** - vinyl-asbestos tile

GLOSSARY

- **actinolite** - one of six naturally occurring asbestos minerals. It is not normally used commercially.
- **Action Level** - a level of airborne fibers specified by OSHA as a warning or alert level. It is 0.1 fibers per cubic centimeter (f/cc) of air, 8-hour, time-weighted average, as measured by phase contract microscopy.
- **amosite** - (brown asbestos) an asbestiform mineral of the amphibole group. It is the second most commonly used form of asbestos in the U.S.
- **amphibole** - one of the two major groups of minerals from which the asbestiform minerals are derived - distinguished by their chain-like crystal structure and chemical composition. Amosite and crocidolite are examples of amphibole minerals.
- **anthophyllite** - one of six naturally occurring asbestos minerals. It is of limited commercial value.
- **asbestos** - a generic name given to a number of naturally occurring hydrated mineral silicates that possess a unique crystalline structure, are incombustible in air, and are separable into fibers. Asbestos includes the asbestiform varieties of chrysotile (serpentine), crocidolite (riebeckite), amosite (cummingtonite-grunerite), anthophyllite, actinolite, and tremolite.
- **asbestos-containing material / asbestos-containing building material (ACM/ACBM)** - any material or product which contains more than 1 percent asbestos (EPA definition).
- **asbestosis** - scarring of the lungs caused by exposure to asbestos. Continued exposure may lead to degeneration of lung function and death.
- **bulk sample** - samples of bulk material; in the case of asbestos, suspect material.
- **carcinoma** - a malignant tumor of epithelial origin, and in this context, referring to membranous tissues of the human body.
- **chain-of-custody** - formal procedure for tracking samples and insuring their integrity.
- **chrysotile** - (white asbestos) the only asbestiform mineral of the serpentine group. It is the most common form of asbestos used in buildings.
- **crocidolite** - (blue asbestos) strongest of asbestos minerals. An asbestiform mineral of the amphibole group. It is of minor commercial value in the U.S.
- **epidemiology** - the study of causes, occurrence and distribution of disease throughout a population.
- **Excursion Limit (EL)** - a level of airborne fibers specified by OSHA as an occupation exposure standard for asbestos. It is 1.0 fibers per cubic centimeter of air, 30-minute time-weighted average, as measured by phase contrast microscopy.
- **fireproofing** - spray- or trowel-applied fire-resistant materials.
- **friable** - material that can be crumbled or reduced to powder by hand pressure.
- **functional spaces** - spatially distinct units within a building which contain identifiable populations of building occupants.

- **heating, ventilation, and air-conditioning (HVAC) system** - the system of pipes, ducts, and equipment (air conditioner, chiller, heaters, boilers, pumps, fans) used to heat, cool, move, and filter air in a building. HVAC systems are also known as mechanical systems.

- **high efficiency particulate air (HEPA) filter** - a type of filter which is 99.97% efficient at filtering particles of 0.3 micrometers in size.

- **homogeneous areas** - areas which appear similar throughout in terms of color, texture, and date of material application.

- **lung cancer** - a malignant growth of tissue in the lungs, specifically of the bronchial covering.

- **mesothelioma** - a rare cancer of the lining around the lungs or the abdomen.

- **mesothelium** - epithelium derived from a mesoderm that lines the body cavity.

- **Permissable Exposure Limit (PEL)** - a level of airborne fibers specified by OSHA as an occupation exposure standard for asbestos. It is 0.2 fibers per cubic centimeter of air, 8-hour time-weighted average, as measured by phase contrast microscopy.

- **personal protective equipment (PPE)** - equipment, such as hard-toed shoes, gloves, respirator, etc., designed to protect a worker from certain workplace hazards.

- **phase contrast microscopy (PCM)** - a method of analyzing air samples for fibers using a light microscope.

- **point counting** - a standard quantitative PLM technique in petrography for determining the relative areas occupied by separate minerals in thin sections of rock. An ocular reticle is used to visually superimpose a point or points on the microscope field of view and record the number of asbestos fibers positioned directly below the graticule point.

- **polarized light microscopy (PLM)** - a method of analyzing bulk samples for asbestos in which the sample is illuminated with polarized light (light which vibrates in only one plane) and viewed under a light microscope.

- **quality assurance / quality control (QA/QC)** - a program for collecting and analyzing additional duplicate samples of suspect material to check on the reliability of procedures.

- **regulated material** - in the case of ACM, a material is regulated by federal law if the asbestos content is greater than one percent.

- **respiratory tract** - the organs of the body which convey air to the blood, allow exchange of gases, and remove carbon dioxide.

- **serpentine** - one of the two major groups of minerals from which the asbestiform minerals are derived - distinguished by their tubular structure and chemical composition. Chrysotile is a serpentine mineral.

- **surfacing material** - material in a building that is sprayed-on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes (AHERA definition).

- **synergistic** - the combination of two effects which is greater than the sum of the two independent effects.

- **thermal system insulation (TSI)** - material applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat losses or gain, or water condensation, or for other

purposes.

- **transmission electron microscopy (TEM)** - a method of analyzing air samples for asbestos fibers using a transmission electron microscope and, possibly, associated instruments for further identifying asbestos.
- **tremolite** - one of six naturally occurring asbestos minerals. Tremolite has few commercial uses.
- **vinyl-asbestos tile (VAT)** - A floor tile made of plastic imbedded with asbestos.
- **visual area estimation (VAE)** - the visual area estimation by a microscopist, using PLM, of the percentage of asbestos fibers present in a bulk sample.